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A
CONCISE HISTORY
OF
ANCIENT INSTITUTIONS,
INVENTIONS, AND DISCOVERIES
IN
SCIENCE AND MECHANIC ART;

Abridged and translated from the

Beyträge zur Geſchichte der Erfindungen

OF

PROFESSOR BECKMANN,

Of the University of Gottingen:

WITH VARIOUS IMPORTANT ADDITIONS.

IN TWO VOLUMES.

VOL. I.

LONDON:
PRINTED FOR G. AND W. B. WHITTAKER,
AVE-MARIA-LANE.

1823.

PREFACE.

The importance of the celebrated work of which the present is a partial abridgment, is already too well established throughout Europe to render any comment on its merit necessary. It has long been made use of by the compilers of publications on the arts and sciences, and has tended more to elucidate the early history of many of the inventions of remote ages than any other production of a single pen. In conduct-

BIBLIOTHECA·BODLEIANA

LONDON
PRINTED BY COX AND BAYLIS, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.

sed, but it was thought unnecessary to extend the number of books in which they are arranged. Others may also, to some readers, appear trifling, and the comprehension of some institutions of police and amusement among *inventions*, may be viewed as too great an extension of the term; but, on the first point, judgment will, no doubt, differ respecting utility, and the last, if it be a fault, is one that is at least harmless, and may be pardoned without apology. A few entire articles, not in the original, have been added, as well as many anecdotes respecting arts and institutions, in England, which had escaped the author.

No other merit is claimed for this abridgment than that of an endeavour to place in a perspicuous point of view ing his researches, the learned Professor has displayed a depth of learning and a soundness of judgment rarely equalled, and few writers have contributed so much to the stock of curious and valuable information upon such a variety of subjects.

The dissertations, which, in the original, are comprised in five large volumes, were published at various periods, in detached portions, and without attention to either technical or alphabetical arrangement. The order in which they are here placed was suggested by a notice of Mr. Johnston's very able translation of the work, which appeared a few years ago, in the Quarterly Review. Some of the articles, indeed, may not be considered as properly classed, but it was thought unnecessary to extend the number of books in which they are arranged. Others may also, to some readers, appear trifling, and the comprehension of some institutions of police and amusement among *inventions,* may be viewed as too great an extension of the term ; but, on the first point, judgment will, no doubt, differ respecting utility, and the last, if it be a fault, is one that is at least harmless, and may be pardoned without apology. A few entire articles, not in the original, have been added, as well as many anecdotes respecting arts and institutions, in England, which had escaped the author.

No other merit is claimed for this abridgment than that of an endeavour to place in a perspicuous point of view a vast mass of learned matter; to divest it of the cumbrous appendage of multifarious notes in various languages; and, by reducing the work into a compendious form, to render it acceptable to those whose time, or taste, preclude them from examining the original.

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ERRATUM.

Note, p. 133, *for* 1550 *read* 1650.

BOOK I.

ON THE ORIGIN OF ANCIENT CUSTOMS AND INSTITUTIONS.

COLLECTIONS

TOWARDS A HISTORY OF

ANCIENT CUSTOMS, INSTITUTIONS, AND INVENTIONS.

BOOK I.

ALMANACKS.

ROMAN KALENDARIUM; — ASTROLOGY; — PRACTICA; — EARLY ALMANACKS;—SHEPHERD'S CALENDAR;—LILLY, THE ASTROLOGER;—PARTRIDGE;—MOORE'S ALMANACK; —EPHEMERIDES;—COURT CALENDAR.

It is well known that the ancients annually published, under the authority of government, a manuscript register of the festivals of the ensuing year, with its divisions according to their calculation of time, and that it obtained the name of *kalendarium,* from those portions of the Roman months called *calendæ,* or kalends; but it is not easy to determine the precise period at which such publications were first printed and circulated by individuals. The accounts which have been transmitted of the productions of the earliest printing-houses contain no mention of such works; either because they were not deemed worthy of notice, or that the great comparative expense of printing at that time prevented their publication. In consequence, no doubt, of the latter motive, we find that the first almanacks with which we are acquainted were computed for several successive years, and were only occasionally renewed.

During the fifteenth and sixteenth centuries, astrology engaged general attention, and the professors of the occult science communicated their predictions on public events in periodical pamphlets, termed *practica,* which were afterwards calculated for a long term, and combined with the almanacks. The oldest of these, of which we have any detailed account, was printed at Augsburgh in the year

1491, although it is supposed that the first was published at Nantes so early as 1463 or 1464. It is written in German rhyme, and, besides the kalendar, contains directions for taking either food or physic, according as the stars predominated; together with instructions for pregnant women, and the rearing of children, and antidotes against pestilence. To this there is not any name affixed; but two others, printed at Strasburgh, about thirty years afterwards, were edited, as we are informed, by the title, "*by the far-famed Master Johannen Künigspergers.*" Of these, one affects to contain a brief account of the art of astronomy, and of the natural influence of the stars, the planets, and the twelve signs, &c.; the other is entitled, "*a new kalendar of medicine, prescribed from observations on the seven planets;*" and contains, besides, calculations of eclipses, and astrological remarks, pointing out the fortunate days for commencing certain undertakings, as well as those which were to be avoided—in the same manner as the ancient Roman kalendars, while under the direction of the augurs, contained days marked white or black, according as the omens regarding them were propitious or unfriendly.

Soon after the above period, in 1523, there was an almanack published at Rostock, in quarto, with handsome wood-cuts, under the title "*the Shepherd's kalendar*"—"der Schapherder's kalender"—which contained, besides the usual information respecting the festivals and the moon, "the nature of the twelve signs and of the seven planets, the course of the celestial and terrestrial spheres; a dissertation on bleeding, cupping, and bathing, together with various medical observations, and a treatise on physiognomy." The author compares the progressive life of man to the twelve months of the year; each period occupying a space of six years.

The title of the "*Shepheard's Calender*" was also adopted in England, where we find it printed in quarto, in 1579; and, in the last century, there was "*the Shepherd of Banbury's rules to judge of the changes of the weather, grounded on forty years' experience.*"

In the time of the civil war between Charles the First and the Parliament, there was one

Lilly who edited an almanack, in which he pretended to foretel the victories of the Republican party. He was indeed a celebrated astrologer, whose fame was spread all over Europe; and who was so deeply skilled in the mysteries of his art, that, as Butler tells us:—

> "—He, by geometric scale,
> Could take the size of pots of ale;
> Resolve by signs and tangents straight,
> If bread or butter wanted weight;
> And wisely tell what hour o' th' day
> The clock did strike, by Algebra."
>
> HUDIBRAS, *Canto I.*

Swift has rendered the name of Partridge, who flourished at a later period than Lilly, common to every reader; but Partridge, although an astrologer, was no impostor, for he was himself the dupe of his art, and implicitly believed in its infallibility.

During the last half century, England has been favoured with the "observations on mundane affairs" of Francis Moore, Physician; and if we may judge by the sale of this almanack, which is said to exceed 200,000 copies annually, the taste for astrological science has not diminished. Nay, there is a new competitor for fame in this most interesting art; and we observe with pleasure, that the world is in future to be enlightened with predictions from the wizard pen and cabalistic brain of a mystic wight, ycleped Sir Willon Lilly Brachm.

There is an extensive catalogue of various almanacks published on the continent of Europe, during the sixteenth and seventeenth centuries; but which, although it includes some curious facts that reflect occasional light upon the manners of those times, possesses too little general interest to merit detail. It may therefore be sufficient to observe, that the oldest Ephemeris was printed at Nuremberg in 1474; and this,—which was calculated by John Muller Regiomontanus,—with the poem of Manilius, were the first works on astronomy that issued from the press. The "*Connoissance des Tems,*" a well-known publication of the same nature, and which is still continued, appeared at Paris in 1678, under the direction of the celebrated astronomer Picard, whose name, however, is not affixed to it. The "*Ephemerides Astro-*

nomicæ," of Vienna, were commenced in 1757, by Maximilian Hell; and our "*Nautical Almanack*" was first published by Dr. Maskelyne, in 1767.

The origin of the Court Calendar may be traced to the *notitiæ* of the Romans, which contain the first list of public officers in the service of the state; and also to the *fasti kalendares*, in which the names of the magistrates and consuls were inserted, as well as the fortunate days and festivals. But the earliest modern publication of this kind, that is deserving of notice, was printed at Vienna in 1636: it contains a brief statistical account of the Austrian states, with a detailed list of all the persons filling public departments, and a minute account of the imperial household; among the officers of which fools are particularly mentioned.

Some authors derive the word "almanack" from the Arabic particle *al*, and *manach*, to count; or from *almanah*, new year's gifts, because the Arabian astronomers used, at the beginning of every year, to make presents of their ephemerides. Others refer it to the

Teutonic *almanachte,* which means observations on all the months; without, however, enquiring whether this word may not itself have an Arabic origin. Others again derive it from the Arabic particle *al,* and the Greek *μην,* a month, or *μανακος,* the course of the months; but the most simple, and the most generally received, derivation, is from the words *al-manach.*

APOTHECARIES.

PHARMACY; — GREEK AND ROMAN PHYSICIANS; — ANCIENT DEALERS IN DRUGS;—ARABIAN PHYSICIANS;—APOTHECARIES IN THE MIDDLE AGES;—DISPENSATORY.

A DETAILED history of the origin and progress of pharmacy, would form a subject of both too great importance and extent for the scope of a mere essay; but a few scattered points of information, which have escaped the notice of professional writers on the *materia medica,* cannot, it is to be presumed, prove wholly unacceptable to those who feel interested in such researches.

It is well known that the Greek and Roman physicians compounded their medicines themselves, and that these consisted chiefly in preparations of simples; but there is reason to suppose, that the collection and sale of medicinal plants was, at a very early period, considered as a distinct occupation. The same herbs were, besides, often employed for the various purposes of culinary use; some in the composition of cosmetics and ointments; others in the formation of painters' colours and dye-stuffs, and the general service of the arts and manufactures; and being, consequently, sought for by all classes, were, necessarily, retailed by persons who were not medical practitioners. We find, indeed, that this trade was so extensive as to require its being divided into separate branches, and that the dealers in each were distinguished by different appellations. Of these, the *pigmentarii* seem to have dispensed cosmetics and drugs for the use of man;* while those herbs that were employed in the diseases of cattle were only to be obtained from the *seplasiarii;* and the

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* This is proved by the existence of a law enacting a punishment for those pigmentarii who should be found guilty of selling poisons:—"*Alio Senatus-consulto effectum est, ut Pigmentarii, si cui temere cicutam, salamandram, aconitam—et id quod lustramenti causa dederint cantharidas, pæna teneantur hujus legis.*"—Digest: lib. xlviii. tit. 8, iii. 3.

pharmacopolæ and *medicamentarii* appear to have sold medicines already compounded, which, from the manner in which they are mentioned, were probably viewed as mere nostrums. The business of these dealers bore, therefore, but a slight resemblance to that of the modern apothecary; and as every kind of warehouse or shop was denominated *apotheca*, so the proprietor, whatever might be his avocation, was called *apothecarius*. We therefore erroneously refer these terms, when they occur in ancient authors, to the profession of an apothecary; and, even in the thirteenth and fourteenth centuries, those who prepared confectionary and conserves for the table, were named apothecaries. The electuaries, syrups, and other medicines commonly in use at that period, were, indeed, usually called confections; and there is a decree of the Emperor Frederick II., containing regulations for the practice of physic in the kingdom of Naples, in which it is expressly enjoined, that fresh and sufficient drugs should be kept, and compounded according to the prescriptions of the physicians, by the *confectionarii*. But although this would seem to imply that physicians prescribed the preparation of the medicines for the particular case on which they were consulted, it in fact appears, that they merely selected them from some established collection of receipts, and that they were kept by the venders in a ready prepared state.

The period when physicians began to resign the preparation of their recipes wholly to apothecaries, is involved in obscurity: it has been supposed that the custom originated in Africa, so early as the time of Avenzoar, in the eleventh century; if that conjecture be correct, it would follow, that the practice must have been introduced by the Arabian physicians into Spain and the lower part of Italy, and, indeed, wherever the possessions of the Moors and Saracens extended. This would also account for the number of Arabic terms of art that are still used in pharmacy and chemistry: for, although the practice of physic, in Christian countries, was confined, during the gloom of the middle ages, to the monasteries, yet the Monks acquired their chief knowledge from the East; and the celebrated Constantine Afer, who, in the year 1086, was an inmate of the Benedictine Convent on Mount Casino, near Salerno, and is known to have rendered the most essential assistance to the School of Medicine in that city, was himself a native of Carthage.

Mention is made, in the records of the city of Augsburgh, of one *Luitfred Apotheker*, as a resident there in the year 1285, and *Hans Apotheker* was city chamberlain in 1317; the same name also occurs in the early annals of other German towns, and it has been thence inferred, that if these persons were not actually apothecaries themselves, they had derived the appellation from some one of their family who had followed that occupation; but there is no positive account of the exercise of the profession in Germany, until about the commencement of the fifteenth century, when they were established, at the public expense, in several of the principal cities. These apothecaries were exempted from all parochial duties, and furnished with a house and a certain annual quantity of wine and corn, for which they were, in some instances, bound to supply the magistrates with a specified portion of confectionary at their public meetings. That they also dispensed the ordinary medicines to the public, gratis, either in consideration of their salary or at the expense of the state, appears from an ordinance among the police regulations framed in the city of Basle, in the year 1440, by which it was decreed, that a physician should be established in every imperial city, with the the allowance of an ecclesiastical benefice, in order that he might give advice without fee; and that "such *costly* articles as persons might choose to have from the apothecary's shop, they should pay for." These shops, however, were so rare, even at a later period, that the city of Berlin did not contain one until the year 1488; when the magistrates granted to one Hans Zehender the hereditary right to practise pharmacy there, together with the privileges and allowances already mentioned, and an engagement *that no other apothecary should be allowed to reside in the city.* Hanover was not possessed of this convenience until 1560, nor the Court of Dresden until 1581; and it is remarkable, that both these were established and supported by females; the first by the reign-ing Duchess, the other by the Electress Ann. A knowledge of medicine, formed, indeed, a part of the accomplishments of ladies in the early ages; and we find that, in 1485, the public apothecary at Augsburgh was a woman.

There is no account of apothecaries in France before the year 1484; in Sweden until 1550; nor in Russia, until the latter end of the same century: but in England, we find it mentioned in the Fœdera, that, in the year 1345, King Edward III. allowed a pension of sixpence per day to Coursus de Gangeland, an apothecary of London, for his attendance on his Majesty during his illness in Scotland. In the year 1606, the apothecaries of the city of London were incorporated with the grocers; but were constituted a separate company in 1617.

The first dispensatory is generally supposed to have been compiled by Valerius Cordus; or, at least, that it was he who first designated a collection of medicinal receipts by the name of *dispensatorium*.

BANKING-HOUSES.

INTEREST OF MONEY;—GRECIAN AND ROMAN BANKERS; —ITALIAN BANKS IN THE MIDDLE AGES;—BANKS OF BARCELONA, AND OF GENOA;—LOMBARDS;—MOSAIC LAW RESPECTING USURY;—LEGALIZATION OF INTEREST;—PAWNBROKERS;—MONTS DE PIÉTÉ.

In the present age, it excites surprize that it should ever have been deemed unjust to receive interest for the loan of money; but our wonder will cease, if we consider, that in the early stages of society, when trade was yet in its infancy, and the principles of commerce were ill understood, those who borrowed seldom had any other object than the relief of their necessities, nor those who lent, any other motive than benevolence or friendship: whereas, now, people are enabled to employ capital to such advantage as may well afford a remuneration, to themselves, for their intelligence and industry in its application, and to the lender, for the risk which he incurs and the opportunity which he loses of employing it himself.

Upon this principle, it is probable that the practice of lending money upon interest began to prevail so soon as the more settled habits of society, and the consequent introduction of the conveniencies of life, had occasioned the establishment of manufactures, and the general interchange of commodities. With the profits thus derived, and the accumulation of wealth in the hands of individuals, there naturally arose a class of traders who became dealers in money, either lending their own capital, or borrowing that of others, in order to re-lend it at an advanced rate. Accordingly, we find bankers mentioned in the laws of the ancient Greeks: but although it is there ordered, that they should not exact a larger interest than what had been at first agreed upon, and that the amount should be moderate, it does not appear that any precise rate was fixed; and it seems to have been matter rather of convention than of legal regulation.

The Romans had banking-houses upon the same plan as that now adopted in this country: people of fortune, and sometimes even the state, caused their revenues to be paid into them, and gave assignments on them to their creditors; and it would appear, that even the manner of keeping their accounts was nearly similar to that still in use.* These bankers not only lent the funds in their hands at interest on permanent security, but also discounted promissory notes, in the modern manner, by deducting the interest from the principal at the time of advancing it. Many of them thus acquired large fortunes, and arrived at the highest dignities of the State; but, as the interest of money was not fixed by law, we find in the ancient satirists many loud complaints of their extortion, and of the severity with which they enforced their claims. Amongst others, Horace describes a rich old miser, who

————————" Ere the money's lent,
Most prudently deducts his cent. per cent.;
Then, as he finds the borrower distrest,
Cruel, demands a higher interest;"

* * * *

" And dooms the wretches, on th' appointed day,
His interest or principal to pay."

Francis, b. i. *sat.* 2 *and* 3.

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* See the article *Book-keeping.*

Such private banking-houses are known to have existed in the chief cities of Italy in the thirteenth and fourteenth centuries; and, about the same period, the first public banks appear to have been established by some of the Italian States, for the purposes of contracting for loans, and managing the collection of the revenue. The subscribers to these loans received transferable bonds from the Government, the interest on which was payable monthly; and they were afterwards sold at variable prices, either with advantage or with loss, in the same manner as the present national funds. But the most ancient general bank for the deposit of cash, and the issue of its own paper in return, appears to have been formed in the city of Barcelona, in the year 1401. Its transactions were guaranteed by the revenues of the town, and regulated by directors, chosen from among the principal merchants; and it enjoyed a long and uninterrupted period of credit, until its dissolution in the beginning of the last century. It has been generally imagined, that the exchange bank of Genoa, which afterwards became so celebrated in the history of commercial affairs, was the first that adopted this plan; but it was, in fact, not established until 1407, and then entirely upon the model of that of Barcelona.* Some time in the 13th century, several opulent merchants from Italy, then almost the only country of Europe in which trade was carried on to any great extent, established banking-houses in the Netherlands, in France, and in England; and these persons being commonly distinguished by the national appellation of *Longobardi*, or *Lombardi*, the title of *Lombards* was also generally given to their banks. They monopolized the trade in the precious metals during a long period; and, even at this day, that part of London in which was their chief residence, is still called Lombard-street, and is yet inhabited by persons of the same occupation. In some instances, however, these establishments were known by the names of the bankers to whom they belonged; amongst whom, the most eminent were the *Corsini*, the *Bardi*, and the *Amanati*; which firms remained long in existence, either in consequence of the credit they had acquired, or that the respective families continued to retain an interest in them.

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* A full account of the bank of Barcelona is to be found in the "*Memorias historicas sobre la Marina, Commercio, y Artes, de la antigua Ciudad de Barcelona*," by Don Antonio de Capmany. Madrid, 4to. vol. i. p. 213.

Notwithstanding that the church, at that period, thundered its anathemas against usurers, and that a general prejudice prevailed against the receipt of even the most moderate interest, exorbitant profits were exacted for loans; and it is mentioned in the *Fœdera*,* that even our King Edward III. having had occasion to borrow a sum of 5,000 marks from the bank of the Bardi, while travelling in France in the year 1329, was constrained to give a bond for 7,000 in return. Not content with extorting extravagant interest, they usually also demanded pledges, which they received at a low valuation, and retained, if not redeemed within a given time: thus uniting, in fact, the business of a pawnbroker with that of a banker. These usurious practices at length brought the Lombards into such detestation, that the different Governments where they were established were obliged to pass frequent laws for their restraint, and some were actually banished. But the trade of Europe was then in too infant a state to dispense entirely with their aid; they were, besides, often useful to the nobility and the state; and they eluded the restrictions of the law, and the prohibitions of the church, by receiving the premium on their loans under the title of a present.

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* Fœdera, vol. iv. p. 387.

The objection to interest on money, which prevailed in the middle ages, originated in an erroneous construction of the Mosaic Law* against usury; which, being converted into a religious prejudice, was strengthened by the exhortations of the monks, and confirmed by severe papal interdictions. But Jews, who had nothing to dread from the anathemas of the Pope, and Christians, who set them at defiance, privately continued the practice, and those were most benefited by it whom the church least wished to favour. Its utility to commerce was, besides, too evident not to be acknowledged; and it is remarkable, that Rome, where it had been most held in abhorrence, was the first State in which it was recognized by law. It is also a curious fact, that this admission of a custom, formerly so obnoxious, was the consequence of an effort to repress it.

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* *Mosaic Law.*—" If thou lend money to *any* of my people *that is* poor by thee, thou shalt not be to him as an usurer, neither shalt thou lay upon him usury."

" If thou at all take thy neighbour's raiment to pledge, thou shalt deliver it to him by that the sun goeth down."

" For that *is* his covering only: it is his raiment for his skin: wherein shall he sleep? And it shall come to pass, when he crieth unto me, that I will hear: for I am gracious."

Exodus, chap. xxii. v. 25, 26, & 27.

The Popes, with a view to check the extortion of usurers, encouraged the establishment of banks for lending money to the necessitous, on pledges, without interest. These were supported by voluntary contributions, to which the public were incited by indulgences and dispensations; but, however powerfully they operated during the fervour of religious zeal, it was found that they gradually lost their force, and eventually became impotent, as the spirit of reformation in the church began to spread. In order, therefore to support the expenses of these lending-houses, which otherwise would have been exhausted by the maintenance of their officers, the Roman Pontiffs were at length forced to sanction the receipt of interest; and were as loud in threatening those who questioned its propriety with the vengeance of the Church, as they had formerly been vehement in denouncing it as contrary to the law of God.

The principle being thus admitted, similar establishments were formed in different parts of Europe: some from motives of humanity, others of private advantage. The latter alone are known in this country, and the profits allowed by law to the proprietors are too exorbitant, not to induce many to embark large capital in them. The former are common on the Continent, where they are generally denominated *Monts de Piété*. The greater part of these were formed in the fifteenth and following centuries, and owed their rise chiefly to the exertions of the Minorite friars. The excess to which usury was carried had, about that period, attracted universal attention; and a Franciscan monk, named Barnabas Interamnensis, conceived the idea of raising a capital by collections, for the purpose of lending it on pledges to the poor, who were to pay a moderate monthly interest for the support of the persons employed in the management of the fund. A proposal to that effect being supported by a brother of the same order, who had been a distinguished jurist prior to his having taken the tonsure, it was submitted to the University of Perugia, and, being approved, a large sum was collected: the plan received the sanction of the Pope, and in this manner the first bank, for the sole declared purpose of advancing loans on pledges, is supposed to have been opened in that city during the pontificate of Pius II., some time about the year 1464.

Barnabas died in 1474, at the monastery of Assisi; but his efforts were ably seconded by another Franciscan, Bernardus Tomatano, a man of a distinguished family at Feltri, in the county of Treviso. This person entered the order in 1456, being then seventeen years of age; and as he possessed a talent for oratory, he was employed in travelling through Italy as a preacher. He soon acquired great celebrity; and he attacked the extortions of the Jews with such vehemence, as, in various places, to excite the populace to acts of outrage against them, although the practices of which he complained were by no means confined to people of that religious persuasion. Taking advantage of the feeling which he had thus elicited, he exerted himself to extend the establishment of lending-houses; and his endeavours were attended with such success, that the plan was very generally adopted throughout Italy. It, however, met with no small opposition, both from the intrigues of the opulent money-lenders, who dreaded its effects upon their usurious gains, and from the religious prejudices of the pious, who held the receipt of interest, under any pretext, in abhorrence. The dispute on this subject was, indeed, carried on with such warmth, particularly between the monks of the Franciscan and Dominican orders,—the former as the advocates, and the latter as the opponents of the measure,—that it at length became necessary for the church to interfere; and, in the beginning of the sixteenth century, Pope Leo X. declared, at the Council of Lateran, that all doubts of the legality of lending-houses were sinful, and issued a bull of excommunication against those who wrote in opposition to them.

It is remarkable that, notwithstanding the interference of the Popes in favour of these banks, they were not established at Rome until the year 1539. That of Naples, which still exists, and is considered the greatest in Europe, was opened in the following year; and in 1563 took the appropriate name of *Banco dei Poveri.* The institution was opposed, in France, by the Doctors of the Sorbonne, who could never divest themselves of the prejudice against interest on money. An attempt was made to introduce it, under Louis XIII., in 1626, but the managers were threatened with punishment, and the undertaking was relinquished. The present *Mont de Piété,* at Paris, was established in the year 1777, and so largely has the public taken advantage of the accommodation thus afforded, that it has been known to have in its possession forty casks filled with gold watches.

The origin of the term "*Mont de Piété*" has not been defined: but it appears that the word *mons*, or mount, was applied to any pecuniary fund at a very early period; it is, therefore, probable that the promoters of this system added *pietas* to give it an air of religion, with a view both to reconcile the public to its adoption and to procure subscriptions, and thus, perhaps, arose the appellation of *Montes Pietatis*, by which the loan-banks were at first distinguished.

Whether this plan has been useful or prejudicial to the interests of society, it is not our object to inquire; but whatever merit may be due to the invention does not belong to those who introduced it at the epoch we have mentioned. The idea originated with the ancient Romans so far back as the reign of Augustus. That emperor converted the surplus revenue of the state, arising from the confiscated property of criminals, into a fund, from which sums were lent, without interest, to those who could deposit pledges of double the value. Tiberius also advanced a considerable capital, from which loans were granted, for a term of years, to those who could give landed security equivalent to twice the amount; and Alexander Severus reduced the interest of money, by granting loans to indigent persons to enable them to purchase lands, and agreeing to receive his reimbursement by annual instalments from their produce.

BILLS OF EXCHANGE.

PROBABLE ORIGIN OF NEGOTIABLE BILLS;—INSTANCES OF THEIR EARLIEST USE;—FORM OF, AND USAGE RESPECTING, ANCIENT BILLS OF EXCHANGE;—LETTERS OF EXCHANGE.

THE invention of bills of exchange is one of the most important in the history of commerce, which, without some such means of liquidating the reciprocal claims, and thus facilitating the transactions, of foreign merchants, would be reduced to a system of mere barter. It is probable, indeed, that they were brought into use soon after the intercourse between the nations of Europe assumed the form of regular trade; but the period at which they were first introduced is uncertain. Traces are, no doubt, to be found among the ancients, of written orders for the payment of money in distant countries, but they seem to have been confined to the individual in whose favor they were drawn, instead of being negotiable securities; and we know that the foreign trade of the Romans was conducted entirely with specie. There is a passage in Cicero's epistles,* in which he says, that he hopes to find security (*prædes*) at Laodicea, by means of which he might remit the money of the republic without being exposed to risk on its passage. The word "*prædes*" may indeed signify insurers; but it has been held by commentators to have a more probable reference to Bills of Exchange.

Much has been written to prove the antiquity of the custom in the middle ages: its introduction has been attributed to the Guelphs and Ghibelines, in the middle of the twelfth century, and some documents are cited, in the writings of the jurist Baldus, which prove its existence in the year 1328; but the clearest and most satisfactory account of it occurs towards the close of that, and the beginning of the following, century.

Among the documents which have been

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* *Cicer. epist. ad famil. lib. ii. epist.* 17.

preserved in the archives of the city of Barcelona, there is an ordinance relating to the trade of that ancient port, dated in 1394; by which it is decreed, that all bills of exchange should be accepted, or refused, within twenty-four hours after presentation, and that the acceptance should be made on the back of the bill.

In 1404, we find, in the same collection, a request from the magistrates of the city of Bruges, addressed to those of Barcelona, for information respecting the custom that prevailed in the latter place, in cases when the holder of a bill of exchange, which had been refused acceptance, either re-negotiated it, or raised money upon it, at such a disadvantage as to occasion an extraordinary loss on the re-exchange. This demand was made in consequence of two bills, which, as it appears, were drawn at a certain rate of exchange, by a merchant of Bruges, in favor of other traders, on a commercial house at Barcelona; and which, being refused acceptance, were returned with charges for which the drawer did not consider himself liable. The question is curious in itself, inasmuch as it involves a point which, even at the present day, sometimes gives rise to disputes; and as the bills are, probably, the most ancient in existence, the following copies of them will not, it is presumed, prove wholly uninteresting to those who take a share in such researches:—

Al nome di Dio, Amen. à di xxvii. Aprile 1404. Pagate per questa prima di camb., à usanza, à Piero Gilberto è Piero Olivò, scuti mille à sol. x Barselonesi per scuto, i quali scuti mille sono per cambio che con Giovanni Colombo à grossi xxii di g. scuto: & pag. à nostro conto, & Christo vi guardi. ANTONIO QUARTI SAL. de Bruggias.

Franc. de Prato & Comp.
à Barselòna.

Al nome di Dio, Amen. à di xviii di Magio 1404. Pagate per questa prima di camb. à usanza, à Piero Gilberto & à P. de Scorpo scuti mille de Felippo à sola. x Barselonesi per scuto: i quali scuti sono per camb. che con Giov. Colombo à grossi xxii di g. scuto: & pag. à nostro conto: & Christo vi guardi.

ANT. QUARTI SAL. de Bruggias.

Francisco de Prato & Comp.
à Barselona.

By these it may be perceived, that the form in which bills of exchange were drawn at that period was very nearly the same as that still in use; that there were first and second bills; that the term "usance" was employed to specify the date of payment; and that the rate of exchange was variable. From the memorial which accompanied them we also learn, that the charges of re-exchange were only disputed in consequence of their being improperly swelled, and that the bills were protested for non-payment; so that, in fact, the whole transaction was in strict conformity with the actual usage of merchants.

There is, however, one slight particularity respecting the form of the bills, which is deserving of notice. The document in which they are recited, speaks of the address of the house on which they were drawn as the *superscription*, and of the tenor as being written *withinside;* from which we may conclude, that they were folded and addressed in the form of letters; and this will account for the still universal custom throughout the Continent, of denominating those instruments "*letters of exchange.*"

BOOK-KEEPING.

ITALIAN BOOK-KEEPING;—ACCOUNTS OF THE ROMAN BANKERS;—INVENTION OF THE MODERN METHOD;—ITS INTRODUCTION INTO ENGLAND;—ANCIENT TREATISES ON DOUBLE ENTRY;—ITS FIRST APPLICATION TO STATE FINANCES;—CURIOUS LATIN TERMS.

THE term "*Italian book-keeping*," which is usually applied to the modern method of arranging merchants' accounts, seems to imply that it was originally invented in Italy; and it probably became known to the rest of Europe, at the period when that country was the great mart of the East-India trade. It is a most ingenious method of stating the pecuniary details of complicated mercantile operations, and is founded on the principle of considering each separate transaction as if it were a real person who is to be made debtor for what is paid, and creditor for what is received. These sums being entered in distinct columns on opposite sides of the same account, their respective amounts can be at once ascertained; the difference between them constituting what is termed the *balance*, and the mode itself being called *double entry*.

Whether the ancients kept their accounts in this precise form is not certain; but we know that the Roman bankers held the cash of various individuals, whose orders upon them for money were sometimes paid by transferring the amount from their account to that of the holder of the order, and that the registers of these transactions were called tables of receipt and expenditure—*Tabulæ*, vel *Codices, accepti et expensi;* from which we may infer that the principle, at least, was then understood.

The modern invention has been generally attributed to a Franciscan friar, named *Lucas di Burgo*, who was one of the greatest mathematicians of the fifteenth century, and who published the first European treatise on the science of Algebra, at Venice, in 1494. This learned and justly celebrated man also translated Euclid into Italian, and was the author of several mathematical and arithmetical works, among which there is a dissertation on the art in question.

In Anderson's History of Commerce it is asserted,* that the first book printed in England, in which any account was to be found of the mode of book-keeping by double entry, was published at London, in the year 1569, by James Peele; who says, in the preface, that he had instructed many merchants in the art, which was then new in England, although it had been long practised in other countries. But mention is made in Ames's Typographical Antiquities,† of a still older treatise on the same subject, entitled, "*A briefe Instruction, and Manner how to keepe Bookes of Accompts after the Order of Debitor and Creditor, and as well for proper Accompts, Particle, &c. By three Bookes, named the Memoriall, Journall, and Leager. Newly augmented and set forth by John Mellis, Schole-maister. London* 1588." But Mellis admits that he had only reprinted the work, which, as he himself informs us, was originally published at London by a schoolmaster, named Hugh Oldcastle, in 1543.

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* Anderson, vol. i. p. 409.

† Ames, p. 410.

That this art was known in Germany at an earlier period than in this country, is proved by the existence of a treatise on it by one Joann. Gotlieb, which was published at Nuremberg so early as the year 1531.

The first application of this principle of keeping accounts to the arrangement of state finances appears to have been made in Hollad, in 1604, by order of Maurice, Prince of Orange, for whose use a system of book-keeping was drawn up by the celebrated Simon Stevin, and published in French, at Leyden, in 1602, with a dedication to the Duke de Sully. This work was afterwards published in both Dutch and Latin; and the person who translated it into the latter language, has, with singular ingenuity, invented words to express the terms that were unknown to the ancient Romans. As a specimen of these may not prove unamusing to the learned reader, we shall close this account with a brief selection. The art itself is termed *apologistica,* vel *apologismus;* the book-keeper, *apologista;* the cash-book, *arcarii liber;* the waste-book, *liber deletitius;* the profit and loss account, *lucri damnique ratiocinium,* vel *sortium comparatio;* the final balance, *epilogismus;* and the counting-house, *logisterium.*

BULL-BAITING.

ROMAN VENATIÆ;—COMBATS OF WILD BEASTS;—SPANISH BULL-FIGHTS;—ENGLISH BULL-BAITS;—BULL-DOGS;—BULL-RUNNING.

If cruelty to animals could be justified by the examples of antiquity, abundant authority might be found in the records of the ancients. The *venatiæ*, instituted by the Romans in honour of Diana, consisted in three distinct sports, which were all designated under that general appellation: in the first, oxen, deer, and even sheep, were turned loose into the arena of the amphitheatre, where the people were permitted to pursue them, and to appropriate those they caught to their own use; in the second, ferocious animals were made to combat with each other; and in the third, they were forced to contend with man. The men who actually engaged on those occasions may, indeed, be exempted from the charge of cruelty, for they were generally slaves, or malefactors, who were unwillingly compelled to risk their lives in an unequal contest with the most savage natives of the forest; but the nobility of Rome, who, in some instances, hired them, the government which permitted such exhibitions, and the people who delighted in them, must all be included in the reproach.

These spectacles were commonly exhibited on the commemoration of victories, and on other solemn occasions; and as the Italian territory produced no other beasts of prey than the wolf and the bear, no cost was spared to procure every other species from abroad. Thus the poet Claudian tells us:—

—— "*Quodcunque tremendum est*
Dentibus, aut insigne jubis, aut nobile cornu,
Aut rigidum setis capitur, decus omne timorque
Sylvarum, non caute latent, non mole resistunt."

"All that with potent teeth command the plain,
All that run, horrid, with erected mane,
Or, proud of stately horns, or bristling hair,
At once the forest's ornament and fear;
Torn from their deserts by the Roman power,
Nor strength can save, nor craggy dens secure."

The havoc thus made was, indeed, so unrelenting, that three or four hundred animals were sometimes butchered in one day; and history informs us, that the incredible number of 11,000 were destroyed during four months that were consecrated to the celebration of Trajan's victory over the Dacians.

Among the animals that were matched against each other, the wild-bull was conspicuous; sometimes being opposed even to the lion and the elephant, and at others baited by dogs. They were also occasionally attacked by the men, which custom is said to have been introduced by Julius Cæsar, who is supposed to have learned it from the Thessalians; but the details which have been preserved, respecting these combats, are not sufficiently minute to enable us to ascertain the manner in which they were conducted.

Bull-fighting is still a favourite sport among the Spaniards and Portuguese, who, indeed, pursue it with a degree of enthusiasm that partakes more of a passion than a taste. They have large uncovered amphitheatres appropriated solely to that purpose, and men trained to the employment; the combats are celebrated with a considerable share of pomp and ceremony, and are attended by persons of the highest rank, amongst whom crowds of elegant females are seen to join their plaudits when a successful *matador* has destroyed his opponent. The ambition of gaining this valued homage to their bravery, sometimes induces young men of the highest families to venture their persons in the contest, and a life thus sacrificed is not considered as ignobly lost. The combatants appear on horseback, armed with a spear and sword, and gaudily dressed in a peculiar costume; and after parading round the interior circle of the amphitheatre, they all retire, except one, who is to engage singly. A door, which communicates with the den in which the bull has been already confined, and goaded almost to madness, is then opened, and the animal rushes forth into the arena, snuffing the air and bellowing with rage. So soon as he perceives his antagonist, he generally eyes him for a moment, paws the ground as if bracing himself for the assault, and then suddenly darts forward with terrific violence. The dexterity of the combatant consists in evading this attack; for which purpose he gallops off, and wheeling round the arena, still pursued by the infuriated bull, watches a favourable opportunity to become, in his turn, the assailant. In this conflict, the horses are often gored to death: or, should the rider be dismounted by accident, he is then obliged, by the established rule, to continue the combat on foot with the aid of the sword alone. He, in that case, wraps his left arm in his cloak, which he holds before him to distract the attention of the bull, and boldly advancing to the encounter, awaits the moment that the animal bends his head with the intent to toss, when he instantly thrusts his sword into the chest, beneath the shoulder blade, and despatches him. In this manner successive bulls are destroyed; but they sometimes wreak their vengeance on their persecutors, and lives are not unfrequently lost in the contest.

This custom is generally supposed to have been derived from the Moors; but the large roofless amphitheatre, the dens communicating with the arena, and much of the ceremonial, are all evidently borrowed from the

Romans. It is also to be presumed, that had it been established among the Moors before their invasion of Spain, some remains of it would still be found in Barbary, where, however, it does not appear to be known; and the stronger probability seems to be, that it has existed among the Spaniards from a much more remote period of antiquity.

The first BULL-BAIT, in this country, is said to have been held at Stamford, about the year 1209, and to have been introduced from the following circumstance: — Earl Warrenne, lord of the town, standing upon the walls of the castle, observed two bulls fighting, until the butchers' dogs interfered and pursued one of them through the town; which sight so pleased his lordship, that he gave the meadow, where the fray began, to the butchers of the town, to be used as a common after the first grass was mown, "on condition that they should find a *mad-bull*, the day six weeks before Christmas-day, for the continuance of that sport *for ever*."

In 1661, another amateur of this sport, Mr. George Staverton, bequeathed "the whole rent of his dwelling-house at Staines, to buy a bull annually for ever; which bull was to be given to the poor of the town of Wokingham, in Berkshire, to be there baited, then killed, and properly divided: the offal, hide, and surplus gift-money, to be laid out in shoes and stockings for their children. The aldermen, and one Staverton, if one of that name should be living in the town, to see the work done honestly."

Charity is, therefore, one plea upon which this practice has been continued; and the efforts made in the House of Commons to obtain its abolition have been opposed and rendered abortive by the specious pretence, *that it tended to keep alive the spirit of the English character!*

We accuse the Spaniards of barbarity on account of their attachment to bull-fights; but we forget that they risk their own lives in an open encounter, and that if they are cruel, at least they are not cowardly: while in this inhuman amusement, the bull is securely fastened to a stake by an iron chain strapped round his neck, and his horns are muffled at the points. The range allowed to him is not large, and his dastardly assailants take especial care to keep beyond it, irritating him by every means in their power, until they find him sufficiently enraged to begin the *sport*. A single dog is then let loose, and should he not succeed in *pinning* the animal, by seizing his nostrils and holding him to the ground, he is aided by a second and a third; but should he still foil their efforts, and gore or tire them, successive dogs are again turned upon him, until their exhausted victim falls beneath their united attacks.

The bull dog is inoffensive when thoroughly domesticated; but, when trained to this savage warfare, acquires a ferocity and thirst for blood, which, aided by his natural strength, renders him truly dangerous. The breed is said to be on the decline; in consequence, it is to be hoped, of the gradual decay of the practice for which it was reared.

Bull-running was a sport confined to the town of Tutbury, in Staffordshire. By custom of the manor, since the year 1374, a bull was annually given by the prior of the abbey to the Minstrels. After having undergone the torture of having his horns cut off, his tail and ears docked and cropped, and his nostrils filled with pepper, his body was smeared with soap, and in that condition he was turned out to be hunted. When taken, or held long enough to pull off some of his hair, he was brought to the stake and baited in the manner already described. To the honor, however, of the inhabitants of the town, they joined in a petition to the late Duke of Devonshire, steward of Tutbury, against the continuance of this barbarous usage; and his Grace gladly availing himself of the occasion, it was abolished in 1778.

COCK-FIGHTING.

ANTIQUITY OF COCK-FIGHTING;—QUAIL-FIGHTS;—ORIGIN OF COCK-FIGHTS AMONG THE GREEKS;—FOOD;—SPURS;—RISE AND PROGRESS OF THE SPORT IN ENGLAND;—BATTLE-ROYAL;—WELCH-MAIN;—ROYAL COCK-PIT;—MANNER OF FIGHTING;—COCK-THROWING.

THE sport of cock-fighting is unquestionably of very ancient origin; yet, perhaps, not so old as some authors have pretended. As the quarrel, related by Herodotus and the historian Ptolemy, in which Adrastus, the son of Midas, king of Phrygia, killed his brother, originated in a dispute respecting a quail, and as this bird is known to have been employed for fighting at a very remote period, it has been thence inferred that this quail must have been one of that description; and as the domestic cock is of a still more irritable disposition, it has been conjectured that it must also have been used, at the same period, for a similar purpose of amusement. If this reasoning be admitted, it would prove that cock-fighting must be of, at least, equal antiquity with the event in question, which took place about five hundred and fifty years before the Christian æra. But quail-fighting, although much in vogue among the Romans, is very rarely mentioned by the Greeks. Lucian, indeed, speaks of quail-fights being exhibited at Athens in the time of Solon; but Lucian had travelled into Italy, and was well acquainted with the Roman customs, some of which he probably ascribed to Athens, long before they were actually established there: he has, besides, been guilty of some known anachronisms, which render him the less entitled to credit.

Ælian relates, that cock-fighting was included among the Athenian public games, in consequence of an incident in the history of that republic. When Themistocles was on the point of giving battle to the Persians, it happened that two cocks were fighting at the moment that he was drawing out his troops, whence he took occasion to animate the soldiers, by remarking to them the obstinate courage with which the animals fought, although they had no object to contend for but mere victory; and, having defeated the enemy, it was ordered that fighting-cocks should be annually exhibited in commemoration of the event. This anecdote has, indeed, been variously related, and the same fact has also been ascribed to Miltiades; but all accounts agree, that some similar event was the origin of the public exhibition, if not of the sport itself. That it was a favourite amusement among the Greeks is proved, not only by the mention made of it by many of their writers, but also by the testimony of various gems and medals on which it is represented. On one of these, in the collection of the late Sir William Hamilton, is a cock, in the attitude of victory, with an ear of grain in his bill, while another appears crest-fallen and defeated; and on another gem, in the same cabinet, are seen two cocks, fighting for a blade of corn, while a mouse steals off with the object of contention: a happy emblem of the issue of many a fiercely contested law-suit.

The Romans appear to have found much

diversion in quail-fights, and they even employed partridges for the same purpose; but cock-fighting was also practised; and Varro mentions, that the best game fowls were procured from Greece. He also observes that they were bad breeders, a peculiarity which still attaches to that race. The Greeks themselves are supposed to have obtained them from Persia; in which country, and throughout the East-Indies, they are indigenous, and are still found in a wild state.

Food of a peculiar nature was given to the birds, to stimulate their courage, as well as to improve their strength. The plant most generally used was called *adiantum*, which is supposed to have been the same as maiden-hair; garlic was employed for the same purpose: and, what is more singular, it was given with a similar view to horses, and even to soldiers. Whether false spurs were in use, is still a point in dispute among the learned.

The origin of cock-fighting in this country has not been determined. The birds were found in England by Julius Cæsar; and it is expressly mentioned, in his Commentaries, that they were kept merely for pleasure,—

"*animi voluptatisque causa,*"—as the natives did not deem it lawful to eat either domestic fowls, geese, or hares. But the oldest account of their being used for fighting is to be found in a description of the City of London, written by William Fitz-Stephen, in the reign of Henry II. There it is mentioned, as an ancient custom, that boys brought game-cocks to their schoolmaster on Shrove-Tuesday, and that the whole morning was devoted to their battles in the school-house. A similar custom prevailed in France, but it was abolished in the year 1260. It was prohibited in England at various periods, in the reigns of Edward III., Henry VIII., and Elizabeth; yet Henry the Eighth himself built a royal cock-pit at Westminster for sports of this kind, and James the First took great pleasure in them.

Notwithstanding every interdiction, and the cruelty of the sport itself, cock-fighting has continued to gain ground, and is practised in almost every quarter of the globe. It is one of the chief amusements throughout the East-Indies and China, and it is a fashionable pastime for ladies in Peru; but in no country has it been carried to greater excess than in England. The birds are selected with as much attention to pedigree as a race-horse; the art of feeding them is a science of the most profound mystery, and its professors men of the greatest self-importance; large sums are staked on the issue of a battle, and the contest is viewed with as much anxiety as a gladiatorial combat of old, or a pugilistic set-to of the present day. The *battle-royal* consists in letting loose a certain number of cocks, which fight until only one is left to claim the victory; *a main* is a set of matches between single pairs, and is determined by the majority of conquerors on either side; but the most regular battle, and the most determinately cruel, is called the *Welch-main.* In this, sixteen pairs of cocks, duly armed, as in the other combats, with long steel spurs, are pitted against each other in succession, until one of each pair is destroyed or disabled; the sixteen victors are then matched against each other, and made to fight until only eight remain, and these are again pitted until their number is reduced to four, which fight two more battles; until at length, after a fifth contest, and thirty-one cocks have been thus butchered, only one remains to claim the prize.

The present Cock-pit Royal is situated on the south side of St. James's Park, and was erected in the reign of King Charles the Second, who is said to have frequently honored it with his presence. It is of a circular form, and completely surrounded with seats six tier deep: the arena upon which the cocks fight is a raised mound of earth, surrounded with boarding, about twenty feet diameter, and, according to the general custom, ought to be covered with a fine turf; but as this would be inconvenient in the metropolis, where matches are frequently decided in the winter, matting is substituted. Previous to the battle being fought, the cocks are weighed with the most scrupulous care, and matched to within an ounce of each other. They are brought to the pit in bags, by their respective feeders, and delivered into the hands of persons called setters-to, who compare their marks and weight with the description contained in the match-bill; and, on these being found to correspond, shew the birds to each other, beak to beak, when the fight commences amidst the discordant clamours of bets and the conflicting opinions and predictions of the various parties interested. These matches usually take place in the evening, generally by candle-light, and are attended by a motley assemblage of spectators, of every rank; but the taste for this sport has been for a long time declining, and it will, no doubt, be ere long wholely abandoned to the lower orders.

The custom of *cock-throwing*,—that is, of throwing sticks at a cock exposed at a stake—which is still practised in this country at Shrove-tide, is supposed to have originated during the war with France in the reign of Edward the Third, and to have been considered as a mark of hatred and contempt for the French people, of whom that bird was the national emblem; but the conjecture rests upon no solid authority, and must be regarded as a mere legend.

CENSORS OF THE PRESS.

INTRODUCTION OF PRINTING;—ESTABLISHMENT OF THE CENSORSHIP;—INSTANCES OF THE ANCIENT EXERCISE OF THE RIGHT;—FIRST APPOINTMENT OF CENSORS;—LICENSER OF THE PRESS IN ENGLAND;—EXCLUSIVE PRIVILEGES OF PUBLICATION.

UPON the introduction of printing, it was found, that the facility with which the copies of books could be multiplied, might occasion the circulation of works that were contrary to religion and the established order of government: the different states of Europe, therefore, every where adopted the general rule, that no one should be allowed to establish a printing-press without express permission; and that no work should be printed until it had been revised by persons appointed for that purpose, and had obtained their formal sanction. The expediency of the measure was not then, indeed, questioned; and, although it had not been previously enforced as a general regulation, yet the principle, that every government possessed an inherent right to prevent the publication of writings that were considered inimical to the interests of society, was universally admitted, and had been acted upon, in particular instances, from a period of the most remote antiquity.

Among the ancient Greeks, the works of Protagoras were publicly committed to the flames; and, in Rome, the writings that were found in the supposed grave of Numa were destroyed because they were contrary to the prevailing religion. In order to check the growth of superstition, or, perhaps, to prevent the circulation of predictions unfavorable to the government, the Roman Senate decreed, that all writings on astrological subjects should be delivered up to the Prætor. This order was frequently enforced; and, in the time of Augustus, more than 2,000 such books were burned on one occasion. The first instance of this infliction, on the mere plea of satire, that did not affect the state, occurred during the reign of the same Emperor, in the destruction of the works of Labienus, and was the origin of the law against private libel. We are told that, within a few years afterwards, the writings of the person who had obtained this decree against Labienus shared the same fate; and it is somewhat remarkable, that the works of Arias Montanus, who assisted in forming the first catalogue of prohibited books in the Netherlands, were afterwards inserted in a similar register.

During the early ages of Christianity, the writings in favor of the new doctrines were frequently suppressed; and, we learn from Eusebius, that the Emperor Dioclesian caused the sacred Scriptures to be publicly burned. But when the Christian religion became more firmly established, the fathers of the church, who had inveighed with bitterness against the heathens on account of the destruction of their books, and had assumed it as a proof of the weakness of the Pagan cause, exercised similar severity against all works that militated against their own opinions: thus were the writings of Arius condemned at the Council of Nice, and those who concealed them threatened with death; the works of Nestorius were burned, by order of the Emperor Theodosius II., at the request of the clergy assembled at the Council of Ephesus; those of Eutyches shared the same fate at the Council of Chalcedon; and similar instances might be adduced in each of the following centuries. But these interdictions were only enforced against works that had been already made public; and we have undoubted proof, in the following circumstance, that the right of previous censorship was not acknowledged. In the year 768, a Benedictine monk, named Ambrosius Autpert, sent an exposition of the Book of Revelation to Pope Stephen III., for the approbation of his Holiness: but he expressly says, that he is the first writer who ever made such a request; that liberty to write belongs to every one who does not mean to impugn the doctrines of the church; and that he trusts this freedom will not suffer on account of his voluntary submission.

The oldest mandate for the appointment of a book censor, at present known, was issued by the Archbishop of Mentz in 1486; but books are extant that were printed in 1479, "*with the approbation of the University of Cologne*," from which we may conclude that the custom had been already established at the latter period; and, indeed, upon the appointment of censors in France, in the year 1650, it was asserted by the Doctors of the faculty of theology at Paris, that they had been in possession of that privilege, by a grant from the Pope, for more than two hundred years. In England there was formerly an officer of this kind, who bore the title of "*Accuser of the press;*" but the office was abolished at the Revolution.

Soon after the establishment of censors, authors began to obtain a special privilege for printing their works, which secured to them the exclusive right of publication. The most ancient upon record was granted by the Bishop of Bamberg, in 1490, for a book, entitled, "*Liber missalis secundem ordinem ecclesiæ Bambergensis.*" Anderson tells us, that the first patent of this kind, which occurs in Rymer's *Fœdera,** was granted in the year

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* *Fœdera, vol. xvi. p.* 96.

1590, by Queen Elizabeth, to Richard Weight of Oxford, for a translation of Tacitus; but, in Ames' Typographical Antiquities, mention is made of one so early as 1510, for "The History of King Boccus, printed at London, for Thomas Godfry, "*cum privielgio regali;*" and other works, printed "*cum gratia et privilegio,*" occur in 1518, 1520, 1521, and several following years.

CHESS.

ORIGIN OF THE GAME;—HINDOSTANNEE, BURMHAN, CHINESE, AND PERSIAN CHESS;—DEVIATIONS FROM THE COMMON GAME;—LUDUS LATRUNCULUS OF THE ROMANS;—INTRODUCTION OF CHESS INTO MODERN EUROPE;—ANECDOTES;—ETYMOLOGY.

THIS most ingenious and fascinating game is generally admitted to be of oriental origin, and its invention is ascribed to a period of the most remote antiquity; but the particular nation of the East in which it had its first rise, and the epoch of its introduction into Europe, are both subjects of conjecture. It has been immemorially practised in Hindostan, and the legendary account of its discovery attributes it to a Queen of the Island of Ceylon, in what the Hindoos term the second age of the world; or, according to the chronology of Sir William Jones, about three thousand eight hundred years ago. The Persians acknowledge that they received the game from India; and the Chinese, for whom the honor of the invention has been claimed, have themselves admitted, that it was not known to them until about one hundred and seventy years before the Christian æra: in the absence of better testimony, we must, therefore, assign the palm to the Hindoos.

The Chinese account of its origin, as detailed by Mr. Eyles Irwin, in the transactions of the Royal Irish Academy, from an ancient manuscript, is as follows:—"Three hundred and seventy years after the time of Confucius, Hung Cochee, King of the Kiangnan, sent an expedition into the Shensi country, under the command of a mandarin called Hemsing, in order to conquer it. After one unsuccessful campaign, the soldiers were put into winter quarters, where, finding the weather much colder than they had been accustomed to, and being, besides, deprived of their wives and families, the army became impatient of their situation, and clamorous to return home. Hemsing, upon this, revolved in his mind the bad consequences of complying with their wishes; and the necessity of soothing his troops, and reconciling them to their position, appeared urgent, with a view to his operations the ensuing year. He was a man of genius as well as a good soldier; and, having contemplated for some time on the subject, he invented the game of Chess, as well for an amusement to his men in their vacant hours, as to inflame their military ardour, the game being wholly founded on the principles of war. The stratagem succeeded to his wish; the soldiery were delighted with the diversion, and forgot, in their daily contests for victory, the inconvenience of their post. In the spring, the general took the field again, and in a few months added the rich country of Shensi to the kingdom of Kiangnan, on which occasion Hung Cochee took the title of Emperor." That Hemsing may have introduced the game among his troops, and adapted it to their genius, is not improbable; but its close resemblance to that of Hindostan, coupled with the date of the supposed invention, must deprive it of all title to originality. It should also be observed, that the Persians have a similar tradition, notwithstanding their admission of its greater antiquity in India.

Considering the complicated moves of the various pieces of which chess is composed, it seems incredible that the game, as now played, could have been invented at once; and of this we have a further proof in the fact, that, although the principles on which it is conducted are every where the same, the mode of playing is not universally similar. Of these variations a slight sketch may not prove wholly uninteresting.

The ancient Hindostannee game—called *Chaturanga*, literally, the four numbers of an army, and sometimes *Chatúraji*, or the four rajahs—consists of four kings, each accompanied by an elephant, a horse, a boat, and four peons, or foot soldiers, and is played by four persons, who command the two allied armies on each side. The elephant has the power of our queen, and the boat that of the bishop, except that it can only move two squares at once; the peon advances like our pawn, but cannot claim an optional rank when arrived at the last line of the enemies entrenchments, only assuming that of the piece whose post he occupies. There are other minor variations from our game; but the chief distinction lies in the moves being determined by dice: thus, if a cinque be thrown, the king must be moved; if a quatre, the elephant; and if a trois, the horse. By this regulation the players are, indeed, placed more upon a level than when the moves are left to their discretion; but it baffles the science of the game, and deprives it of its greatest interest.

The Burmhan game—an improvement on the former—is termed *Chit-tha-reén*, which signifies, indifferently, either generalissimo, or warfare; and the name seems to imply that it was derived from the Sanscrit *cha-turanga*. It is played by only two persons, and there are, on each side, a king, a general, two chariots, cavalry, and elephants, with the usual number of foot-soldiers, called yeins. The king has the common moves and powers, except that he cannot castle, and that the stale-mate is not admitted; the general moves diagonally, but only one square each time; the chariots and cavalry have powers similar to our castles and knights;

the elephants have five moves, directly and diagonally, but limited to two squares; and the yeins may be promoted by attaining certain positions, without arriving at the extreme line of the adversary's section. One material feature of this game is, that each party is allowed, at the commencement, to arrange his pieces in their row, in whatever order he may think proper; a liberty which, undoubtedly, affords a greater semblance of a real battle than the ordinary mode.

In China, chess is termed *Choke-choohong-ki*, or the science of war. It is composed of a general, two counsellors, and the same number of chariots, of cavalry, of elephants, and of artillery, with the customary number of soldiers. The general, counsellors, chariots, cavalry, and elephants, have respectively nearly the same moves and powers as the chief pieces in the Burmhan game; but the artillery have all the moves of our castle, with this difference in their power, that they pass over the piece directly opposed to them, and take that immediately in its rear; the soldiers advance one square each time, and take their antagonist transversely, to the right and left, instead of diagonally, but are not capable of promotion. Another striking peculiarity in the Chinese game, consists in a blank space being left in the centre of the board; this is intended to represent a trench, over which the light troops are supposed to pass on pontoons; but these not being presumed adequate to support the weight of elephants, they are reciprocally confined to their respective sections.

The Persian game, from which the modern European chess has been evidently derived, is called *Schah-trang*, and comprises a shah, or king, a vizier, two elephants, and an equal number of cavalry and chariots; all of which have similar moves and powers with our pieces, except that the king can neither castle nor be stale-mated, and that the vizier and the elephants, which represent our queen and bishops, can only move diagonally: the former one, and the latter two squares, each time. The piadahs, or pawns, differ only from ours in moving but one square at first. The game is always opened by the vizier advancing one step in a direct line, preceded by his pawn, and is closed by the final surrender of the king, which is termed *schah-mat.*

Of these Asiatic games there are, besides, many minute varieties; but this coincidence prevails among all, that the board invariably consists of sixty-four squares, and is not chequered. Some deviations from the established rules have been also occasionally introduced into modern European chess. *Arch-chess* was played on a board with one hundred squares, besides two new pieces, styled the centurion and the decurion, and two additional pawns on each side. *Round-chess* was so named from the circular form of the board, which was divided into sixty-four parts of four circles; and the *Duke of Rutland's game* consited of one hundred and forty squares, with fourteen pawns, and as many pieces, on each side. The *German military game*, once much in vogue on the Continent, was played on one hundred and twenty-one squares, and each division contained a king, two guards, a similar number of dragoons and hussars, five cannoniers, and eleven fusileers. The Russians, in addition to the usual moves, give that of the knight to the queen; they also play four persons at a time, two against two, on a board containing more than the usual number of squares and pieces.

It has been generally supposed that the ancient Greeks and Romans were acquainted with chess: and, indeed, some authors have attributed the invention to the former, and even carried it so high as the siege of Troy; but the assertion rests only upon conjectural grounds, and the history of Greece affords no positive testimony of the fact. Their intercourse with the Persians, and the long wars between the two countries, during which the prisoners on either side must have reciprocally communicated and received each others customs, renders it, however, highly probable that it was not unknown to them. The Romans, who derived many of their domestic institutions from the Greeks, must, therefore, have obtained an early knowledge of the game; or, at least, their subsequent Asiatic conquests must be presumed to have rendered it familiar to them; unless, indeed, we assign a much more recent period than that usually admitted to the Oriental invention. Many allusions to it are to be found in the classic authors, and it is commonly imagined that the game mentioned by Seneca, as the *ludus latrunculorum*, was actually chess: but there are also reasons to doubt the propriety of that application of the term; and even the Roman *scaccarium*, or exchequer, that was found at Pompeii, and which resembles a chess-board, does not afford conclusive evidence of the fact, as it is known to have been used for the purposes of arithmetical calculation. The pieces with which the game thus alluded to was played, were usually formed of either stained wax or coloured glass, and were, indifferently, termed *calculi* and *latrunculi*; but these were also used in a game that was played with dice, and seems to have nearly resembled our backgammon. It is, therefore, not easy to determine, with any degree of certainty, to which of these games the observations we meet with are intended to apply, and we have no account of either sufficiently minute to ascertain the precise form. The fullest description is contained in some lines of a poem addressed to Piso, which is inserted at the end of some editions of Lucan, and is usually ascribed to that author: they are as follow:—

" *Te si forte juvat, studiorum pondere fessum,*
Non languere tamen, lususque movere per artem,
Callidiore modo tabulla variatur aperta
Calculus, et vitreo peraguntur milite bella,
Ut niveus nigros, nunc et niger alliget albos.
Sed tibi quis non terga dedit? quis, te duce, cessit
Calculus? aut quis non periturus perdidit hostem?
Mille modis acies tua dimicat: ille petentem
Dum fugit, ipse rapit: longo venit ille recessu
Qui stetit in speculis: hic se committere rixæ
Audet, et in prædam venientem decipit hostem
Ancipites subit ille moras, similisque ligato
Obligat ipse duos: hic ad majora movetur,
Ut citus et fracta prorumpat in agmina mandra,
Clausaque dejecto populatur mœnia vallo.
Interea, sectis quamvis acerrima surgunt
Prœlia militibus, plena tamen ipse phalange,
Aut etiam pauco spoliata milite vincis,
Et tibi captivæ resonat manus utraque turbæ."

" When to relieve the labours of thy mind,
Thou turn'st from deep research in arts refin'd,
Not in soft indolence you waste the hour,
But happier genius still exerts its power;
To mimic war the radiant troops are led,
And martial ranks the varied table spread;
There sable bands, and *here* a snow-white train,
With doubtful fate of war the fight maintain.

> But who with thee shall dare dispute the field?
> Led by thy hand, what warrior knows to yield?
> Or, if he fall, he falls with glorious pride,
> His vanquish'd foe extended by his side.
> Unnumber'd stratagems thy forces try:—
> Now artful feign, and only feign, to fly;
> Now boldly rushes, 'midst the ranks of war,
> The chief who view'd the slaughtering scene from far.
> *This* bravely daring in the arduous toil,
> Repels the host advancing to the spoil;
> While cautious *that* moves dreadful on, and slow,
> And fraudful, meditates the certain blow.
> What though in guise a slave, he seems, in chains,
> Two captives he in durance close detains:
> But see, yon hero with impetuous haste,
> Bursts through the ranks, and lays the ramparts waste!
> While thus the mighty battle glows around,
> And prostrate chiefs bestrew the well-fought ground,
> Full and unbroken, lo! thy squadrons stand,
> Or scarce one warrior lost of thy command;
> The captive crowds thy victory proclaim,
> And foes confess thy undisputed fame."

This account seems to designate a game at least very nearly resembling our chess: but, considering the estimation in which it is now held, it excites some surprise to find that the younger Pliny, when speaking of its being played by his friend Quadratilla, seems to rank it with the amusement of viewing pantomimic dancers; and says, that on those occasions she always dismissed her grandson to his studies, from a certain reverential awe which she felt in his presence.

The period at which the chess with which we are acquainted was introduced into Europe has not been ascertained, but there can be little doubt that it was brought at a very early age into Italy and Spain by the Saracens and Moors; in proof of which, history tells us, that Jussuf, a Moorish king of Granada, when made captive by his brother, was playing at chess at the moment when an officer appeared in his presence with an order to put him to death: Jussuf, however, earnestly requested permission to finish his game; which, being granted, news arrived before it was concluded that his brother was dead, and he himself elected to the throne. The Crusaders must also have learned it in the East: and, accordingly, we find that it was known, even in this country, in the twelfth century; for it is recorded, that our King John insisted upon finishing a game of chess before he would give audience to the deputies from Rouen, who came to apprize him of the important intelligence that their city was besieged. Numerous other anecdotes are related of the attractions of this bewitching game; among the most prominent of which, is that of King Charles the First, who, being at chess when it was announced to him that the Scots intended to surrender him to the English, heard the intelligence without appearing discomposed, and then coolly continued his match. Charles XII. of Sweden, when attacked by the Turks at Bender, after having barricadoed his house and arranged the means of his defence, is said to have sat calmly down to chess, and to have been soon absorbed by the interest it commanded. It is told as a characteristic trait of this monarch, that he invariably employed the king more than any other piece, although he thereby constantly lost every game.

The etymology of the term *chess* is as unsettled as the origin of the game itself, but it seems probable that it was derived from the Persian word *schah,* which signifies a king. The Italians call it *scacchi;* the Germans, *schachspiel*; and the French, *échecs:* from some of which we may have taken our word *check*. The *pawn* seems to have been evidently so called after the *peon;* while the *rook*, though now generally termed a castle, no doubt took its name from the Persian *rukh*, which is the corresponding piece in that game; and it is remarkable, that in all the languages we have enumerated, the word *mat*, or mate, is preserved, and a term is used corresponding with the *schah-mat* of the Persians.

CHIMNEYS.

ANCIENT STYLE OE LIVING;—HOUSEHOLD OF THE EARL OF NORTHUMBERLAND;—ENGLISH HOUSES DOWN TO THE REIGN OF QUEEN ELIZABETH;—ORIGIN OF THE CURFEW;—ITS INTRODUCTION INTO ENGLAND;—ITS CONTINUANCE IN OTHER PARTS OF EUROPE;—VESTIGES OF ITS REMAINS;—EARLIEST RECORDS OF CHIMNEYS;—FIRST ERECTION OF, IN MODERN ROME;—WHETHER KNOWN TO THE ANCIENTS;—BRAZERO;—CHIMNEY-SWEEPERS.

THEY who have never experienced the want of the domestic comforts of every description which London and the other cities and great towns of England now afford, will not readily conceive how our ancestors contrived to pass their lives with any degree of enjoyment, in the midst of those numberless inconveniences with which they were surrounded, and in the absence of almost all those luxuries, the privation of any one of which would grievously disturb the temper of the present generation. It has been remarked, that the word "comfortable" is in itself not alone peculiar to the English language, but the meaning it conveys is solely expressive of English ideas, or rather, exclusively descriptive of our habits. If this observation be correct with regard to the present refined state of society on the Continent, how much more justly may it be applied to the mode of living in this country only a few centuries ago, and how little does it leave us to envy of the enjoyments of our forefathers in those "good old times," which are the constant theme of regret with the discontented of the present day. We may form a tolerably correct notion of the comforts of the poor about the beginning of the sixteenth century, from the enumeration of the luxuries registered at that period in the household book of the great Earl of Northumberland. From this it appears, that in one of the most splendid establishments of the kingdom, the retainers and servants had but spare and unwholesome diet: salt-beef, mutton, and fish, three-fourths of the year, with few or no vegetables; what few delicacies there were, appeared solely at his lordship's table, and even the fuel was measured out with a niggard hand. My lord and lady themselves do not seem to have fared very delicately, for they "had set on their table, for breakfast, at seven o'clock in the morning, a quart of beer, as much wine, two pieces of salt-fish, six red-herrings, four white ones, or a dish of sprats." "So that," as Hume justly remarks, "there cannot be any thing more erroneous than the magnificent ideas formed of the *roast-beef of old England*."

However, that we may not be accused of unfairly depreciating the style of his lordship's living, we should add that, on great occasions,

> "When sumptuous feasts were spread in antique halls,"

"the board was loaded with capacious pewter-dishes, filled with butchers' meat of all kinds, with venison, poultry, sea-fowls, wild-fowls, game, fish, &c. &c., dressed in different ways, according to the fashion of the times. The sideboards were plentifully furnished with ale, beer, and wines; which were handed to the company, when called for, in pewter and wooden cups, by the mareschals, grooms, yeomen, and waiters of the chamber, ranged in regular order." The family too, it appears, had their four meals a day: breakfast, dinner, supper, and "livery." They breakfasted, as we have already seen, at seven; dined at ten; supped at four; and the "livery," which consisted of bread, beer, and spiced wine, was served in their chambers between eight and nine.

Down to the reign of Elizabeth, the greater part of the houses in considerable towns had no chimneys: the fire was kindled against the wall, and the smoke found its way out as well as it could, by the roof, the door, or the windows. The houses were mostly built of wattling, plastered over with clay; the floors were of earth, strewed, in families of distinction, with rushes; and the beds were only straw pallets, with a log of wood for a pillow. In this respect, even the King was no better off than his subjects, for, in Henry the Eighth's time, we find directions "to examine every night the *straw of the King's bed*," that no daggers might be concealed therein." In the discourse prefixed to Hollingshed's Chronicle, published in 1577, the writer, speaking of the progress of luxury, mentions three things especially, that were "marvellously altered *for the worse*, in England:" the multitude of chimneys lately erected, the great increase of lodgings, and the exchange of treene-platters into pewter, and wooden spoons into silver and tin; and he complains bitterly, that nothing but oak for building houses was then regarded, "for when our houses," says he, "were built of willow, then we had oaken men; but now that our houses are come to be made of oak, our men are not only become willow, but a great many altogether of straw, which is a sore alteration." And, in a manuscript of Aubrey's, in the Ashmolean Museum, of the date 1678, it is stated, that "antiently, before the Reformation, ordinary men's houses, and copyholders, and the like, had no chimneys, but flues like beaver holes; some of 'em were in being when I was a boy."

That chimneys were not known from the tenth to the thirteenth century, may be presumed from the continuance of the custom of the curfew, which arose thus :—In what are usually termed the middle ages, the fires in houses were made in a cavity in the centre of the floor, over which there generally was an opening in the roof for the escape of the smoke ; and when the fire was out, or the family retired to rest, the place in which it was made was closed by a cover.* In those days a law was almost universally established on the Continent, that fires should be extinguished, and the family be all at home, at a certain hour in the evening, which was notified by the ringing of a bell; that, in this country, was called the *corfeu*, and was evidently derived from the French *couvre-feu*. This law was introduced into England by William the Conqueror, to prevent nocturnal assemblages of the people ; and although it was abolished in the following century by Henry the First, it yet remained in force long after, throughout many parts of Europe. So late as the year 1347, there is an edict, renewing a bull published by Pope John XXIII., in which it is ordered, that every person, on hearing the *ignitegium*, or curfew, should repeat the ave-maria thrice; and this is, doubtless, the origin of the evening chimes, which are still, in some places, called the prayer-bell, and of the *angelus* of the Spaniards. This ancient custom is also supposed to have given rise to a saying, still used in Saxony when a company wish to separate, "that they hear the *burgher-bell*."

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* A "*cover*" of this description is engraved in the Antiquarian Repertory, vol. i., p. 89, and is there called a curfew; but its having been employed for the purpose we have described has been doubted by that learned antiquary, Dr. Samuel Pegge ; who, however, appears not to have been aware that such a custom ever existed.

Although it is not probable that the law of the curfew was any where enforced after the fourteenth century, it is remarkable, that the custom of announcing it to the inhabitants of the towns in Germany was continued down to the end of the seventeenth, as we learn from the travels of Mabillon in that country, in 1683; who, speaking of watchmen, says that, "at the hour of curfew, which in winter is eight, and in summer nine, the call out to the townsmen 'to extinguish lig' and fire :'—" *Insonat hora nona, extinguite lumen et ignem, ut nos Deus cum Maria tutetur.*" Even in this country vestiges of it are still to be found; and until lately, if not at present, a bell used to be tolled, in some towns in Yorkshire, at seven in the evening, during the twelve days of Christmas, which was called the *culfer*, or, as the inhabitants translate it, the *cool-fire*.

Chimneys are, indeed, mentioned, for the first time of which there is any record, in the very year of the edict to which we have just alluded; for, in an account of an earthquake that occurred at Venice in 1347, it is expressly said, that several chimneys were thrown down. But we also find that, in 1368, a Paduanese nobleman, named Francesco da Carraro, paid a visit to Rome, and being lodged at the sign of the Moon, an inn of note, he found that the fire was kindled, "*according to the universal custom of the city,*" in a brazier placed in the middle of the room; whereupon he sent for workmen, and caused two chimneys to be constructed, "*in the manner of those in use at Padua;*" and over these, which were the first ever erected in modern Rome, he placed his arms, as a memorial of the event. If Signor da Carraro were to visit the Peninsula at the present day, he would find abundant employment in this way; for, throughout Spain and Portugal, no house possesses any chimney but that which belongs to the kitchen, and, when it is found necessary to warm other apartments, a fire of charcoal is placed in the centre of the room, in a brass pan, termed a *brazero*. This custom is, indeed, as old as the times of the Greeks and Romans, who had no other means of warming their apartments until the latter invented flues which conveyed the heat underneath; and it is still practised in the greater part of Greece.

Whether the ancients were acquainted with the use of chimneys, is a question that has occasioned much learned controversy; but, after the closest examination, it appears to be clearly decided in the negative.

On this subject some of our readers will, doubtless, recollect the description of the inn mentioned in Horace's account of his journey from Rome to Brundusium, as one proof, among many, that the houses were not then provided with chimneys :—

> " *Tendimus hinc rectâ Beneventum, ubi sedulus hospes*
> *Penè arsit, macros dum turdos versat in igne :*
> *Nam vaga per veterem dilapso flamma culinam*
> *Vulcano, summum properabat lambere tectum.*
> Lib. i., sat. 5.

> " At our next inn our host was almost burn'd,
> While some lean thrushes at the fire he turn'd ;
> Through his old kitchen rolls the god of fire,
> And to the roof the vagrant flames aspire."
> FRANCIS.

Neither will it escape observation, that the images of the ancestors of the great Roman families, which were placed in the *Atrium*, or hall, of their houses, where a fire was constantly kept, were termed *fumosæ*, from their being covered with soot, and that the name of the Atrium itself was derived from the same circumstance.

While chimneys were erected in the wide and simple manner in which they are still to be seen in some old mansions, they were easily cleansed by the common house servants; but, when the flues were constructed in a narrower and more complex form, the operation was rendered difficult, and this employment became the occupation of regular chimney-sweepers. These were, at first, all natives of Savoy and Piedmont; and throughout many parts of the Continent those industrious people still follow the same loathsome business. In Paris, groups of little Savoyards are seen, many of them hardly eight years old, who climb up the narrow chimneys of the lofty houses for the trifling remuneration of five sous! Accidents of the most distressing nature often occur to them; and even were that not the case, humanity, one should suppose, would shrink from exposing infants to the dangerous and disgusting ordeal of ascending, at the hazard of their lives, through narrow funnels, filled with soot and smoke, in which respiration is scarcely possible until they have attained the summit; and yet, neither in that refined metropolis, nor in our own enlightened capital, have the sufferings of these unfortunate beings received any alleviation from the Legislature.

COACHES.

ANCIENT MODE OF CONVEYANCE;—CHARS;—INTRODUCTION OF COVERED CARRIAGES INTO GERMANY;—EFFORTS TO SUPPRESS THEM;—GRADUAL PROGRESS, AND INTRODUCTION INTO FRANCE;—WHIRLICOTES;—INTRODUCTION OF COVERED CARRIAGES INTO ENGLAND;—OLD ENGLISH COACHES;—HACKNEY-COACHES;—STAGE-COACHES;—FIACRES;—FRENCH AND GERMAN DILIGENCES;—MODE OF TRAVELLING IN SPAIN;—DUTCH COACHES;—GLASS-COACHES;—ETYMOLOGY OF COACHES AND HAMMER-CLOTHS.

ALTHOUGH carriages, for both amusement and convenience, were known to the ancients, yet they seem to have disappeared during the dark ages, and not to have been recalled from oblivion, until the revival of the arts and letters had again introduced some portion of polished luxury. During the continuance of the feudal system, the vassals always attended their lords on horseback:

masters and servants, husbands and wives, clergy and laity, all rode on horses or mules; and sometimes women and monks ambled on asses. Ministers of state, magistrates, and ambassadors, paraded on war-horses; his holiness the Pope mounted a white palfrey, and emperors and kings thought themselves honored by holding his stirrup.

There is an ordinance on record, issued in France in 1294, during the reign of Philip the Fair, by which the wives of citizens are prohibited from using carriages; but the term employed is "*chars*," and it is probable that they were nothing more than mere open cars, with some kind of decoration. A drawing is, indeed, preserved in the King's library at Paris, of a carriage, there entitled "*char*," that was in use near three centuries later, and which is represented with a canopy supported on pillars, and surrounded with curtains that could be drawn up at pleasure; but these ornaments were added at a much more recent period than that to which we have alluded.

It was not until the close of the fifteenth century that covered carriages were brought into use. The first of which we have any account, was used by the Emperor Frederic III. on his entrance into Frankfort in 1474; but there is no description of its form, and we only learn that it was not open from being told that he remained in it during the ceremony of his entry. In the narrative of a tournament given by the Elector of Brandenburgh, in 1509, we read of one carriage that was gilt all over, of twelve others ornamented with crimson, and another hung with satin; but these were only used by ladies of the highest rank, and both then, and for a long time afterwards, it would have been considered disgraceful to a man to have been seen in one. By degrees, however, this prejudice began to wear out; and the great continental feudal lords, dreading that it might enervate the martial spirit of their retainers, took alarm at the innovation. In 1588, we find a very animated appeal from the Duke of Brunswick to his vassals, against the effeminacy of the new custom, with a positive order to them not to appear on the road, or even at court, but on horseback; and, in the archives of the county of Mark, an edict is still preserved, forbidding the use of coaches under penalty of felony.

Notwithstanding these efforts to suppress carriages, they were, by degrees, first employed by invalids; then by persons of rank on long journies; and, towards the end of the sixteenth century, they had become pretty general in Germany, and had assumed some degree of elegance, although they were still without springs, and were merely hung on leather straps. In some old stanzas, composed on the occasion of the marriage of the Palsgrave William with the Lady Renatta, in February 1568, there is a long description of the bridal carriage; from which we learn, that it was not only superbly gilt, and lined with red satin, but also that the Prince's arms were emblazoned on it. The coaches at the court of the Emperor Leopold are described as having been covered with red cloth, studded with black nails; and the imperial carriages alone were distinguished by having leather traces, which, on festivals, were ornamented with silk fringe; while those belonging to persons of inferior rank were only drawn with ropes. Some of these carriages were, however, more splendidly decorated; and that made for the occasion of the first marriage of the Emperor is said to have cost thirty-eight thousand florins.*

In the year 1550 there were but three coaches in Paris; one belonging to the Queen; another to Diana de Poictiers, the mistress of Henry II.; and the third to a nobleman named René de Laval, who from extreme corpulency was unable to ride on horseback. Even Henry the Fourth, of France, had but one carriage for himself and his Queen; and a letter of his has been preserved, in which he excuses himself from calling on a friend, "because his wife was using the coach." That monarch was, indeed, assassinated in a close carriage; but he usually rode through the streets of Paris on horseback, and, although we may presume that he was not unattended, carried his cloak-bag behind him.

The first carriages used in England were called *whirlicotes*. They appear to be as old as about the middle of the fourteenth century; for history informs us, that King Edward III. appeared at a tournament in Smithfield along with his mistress Alice Pierce, "in a triumphal car;" and that when Richard II. was flying before Bolingbroke, his mother rode in a carriage: but we have no description of their form, and they probably resembled the ancient "*chars*" already mentioned. Stow says, in his Survey of London, that coaches were first introduced into England from Germany, by Fitz-Allen, Earl of Arundel, about the year 1580; and they are supposed to have been in common use within little more than twenty years afterwards. But in an account which has been transmitted by Dr. Nicholas Robinson, afterwards Bishop of Bangor, of "the grand reception and entertainment of Queene Elizabeth, at Cambridge, in 1564, we find that Sir William Cecil, Secretary of State and Chancellor of the University, having a sore leg, *came with his lady in a coach.*" From the casual manner in which this circumstance is mentioned, we should conclude that coaches were, at least, known in this country at that period; although the same account informs us that Her Majesty herself arrived on horseback.

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* *Thirty-eight thousand florins,*" equal to about £4,000.

In England, however, the use of vehicles of this kind was but slowly introduced. The celebrated Duke of Buckingham was the first who exhibited a coach with six horses; and although that pomp was ridiculed on its first appearance, yet the cumbrous machines then in vogue seem to have demanded all their strength. The description given by a popular writer of the present day, of those in use in Scotland during the reign of Charles the Second, is at once so just and animated, that we shall offer no apology for transcribing the passage in which it occurs: "The Lord Lieutenant of the county, a personage of ducal rank, alone pretended to the magnificence of a wheeled carriage; a thing covered with tarnished gilding and sculpture, in shape like the vulgar picture of Noah's ark, dragged by eight long-tailed Flanders mares, carrying eight insides and six outsides. The insides were, their Graces in person; two maids of honour; two children; a chaplain stuffed into a sort of lateral recess, formed by a projection at the door of the vehicle and called, from its appearance, the boot; and an equerry to His Grace ensconced in a corresponding convenience on the opposite side. A coachman and three postillions, who wore short swords, and tie-wigs with three tails, had blunderbusses slung behind them, and pistols at their saddle-bow, conducted the equipage; and on the foot-board behind this moving mansion-house, stood, or rather hung, in triple pile, six lacquies, in rich liveries, armed up to the teeth."*

Carriages for hire were first introduced into London in the year 1625. There were, at that time, only twenty, and they did not stand in the streets, but were kept at the principal inns. In 1637 there were fifty hackney-coaches, which we must suppose to have been much employed, as the police regulations of that period limit the number of horses to be kept for each to twelve. In 1654 they had already increased to three hundred, for which six hundred horses were kept; in 1694, we find them limited to seven hundred; and in 1715 to eight hundred:

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* Tales of my Landlord.—"*Old Mortality*."

the present number is twelve hundred. The establishment of stage coaches followed soon after that of other hired carriages; and the comedy of "The Committee," written during the Commonwealth, opens with the descent of the company from the Reading stage. But these were very dissimilar to the light vehicles now in use: inelegant and heavy, they moved cautiously during the day, and never ventured on the road at night; and we may judge of the difference between the mode of travelling in the beginning of the last and present century from the following copy of a card which is still preserved at York, in the bar of the same inn to which it refers:—

> "York Four Days Coach, *begins the* 18*th of April* 1703.
>
> "All that are desirous to pass from London to York, or from York to London, or any other place on that road, let them repair to the Black Swan in Holbourne, in London, and to the Black Swan in Coney Street, York, at each which places they may be received in a stage coach, every Monday, Wednesday, and Friday—*which performs the whole journey in four days*—if God permit!"

The same distance is, now, usually performed in about twenty-eight hours.

Hackney-coaches do not appear to have

been established in Paris until about the year 1650: they were first introduced by one Nicholas Sauvage; and they obtained the name of *Fiacres*, which they still retain, from the residence of the proprietor being at the *Hôtel St. Fiacre*,* in the *rue St. Martin*. These, from being at first only kept in readiness at the owners' stables, were afterwards gradually placed in the streets; then, some went at stated periods with passengers from one quarter of the city to another; and, in the year 1662, carriages with four horses were exclusively appropriated to convey persons to the different residences of the court. This was the origin of stage coaches in France; and they have not, even yet, made any great progress towards improvement. The French *diligence* is an unwieldy contrivance, which, although it is sometimes dignified with the title of *velocifère*, moves but little faster than the York fly of the last century; and is under the control of a travelling superintendent, who, as "*Monsieur le conducteur,*" not only regulates its solemn march, but usually presides at the table of the passengers.

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* For some account of "*St. Fiacre*," see b. iii. art. *Stocking-frame.*

In no country, indeed, is the convenience of travelling in public carriages so well understood as in England: the *Postkutsche* of Austria, and the *Landkutsche* of other parts of Germany, are still inferior to the French *diligence;* nor are the stages in those few parts of Italy where they are to be found, at all superior. Denmark, Sweden, and Russia, are without public conveyances for travellers, who, therefore, have no other alternative than to make use of their own carriage and post-horses, or to make an agreement with some carrier; and neither Spain nor Portugal present even the resource of post-horses for a carriage, except on the roads from Madrid to the royal residences, and to Cadiz. In the latter countries the ancient mode of travelling in horse litters is still usual among ladies; and, in the provinces of Guipuscosa and Biscay it is not unusual to see two females seated each in a kind of chair, slung on either side of the pack-saddle of a horse, and covered with a housing. The coaches used for the road are coarsely built and clumsily fashioned, gaudily painted, and lined with crimson or yellow velvet, but suspended merely upon straps, and containing an enormous projection, in the form of a footboard, on which the bedding as well as the luggage of a family is not unfrequently piled. These are usually drawn by a *tiro* of seven mules, of which one is considered as the leader, and are conducted by two *caleseros*, who stand upon a platform in front, the one holding the two wheel mules, which alone have reins, the other ready to descend at a moment on any sudden emergency; which he performs with admirable dexterity, without stopping the carriage, and in like manner resumes his place, at one bound, although it were moving at a full trot. The average rate of travelling does not exceed eight Spanish leagues, or about thirty miles a day.

Many of the principal cities of Europe are still without hackney-coaches; and at Amsterdam they are not permitted to have wheels; the body is therefore placed upon a sledge, which is drawn, at a sober pace, by one horse, guided by a coachman, who walks beside him.

In the beginning of the seventeenth century, when the use of carriages first became general, the pannels of those employed on state occasions were formed of glass; whence has arisen the distinction, now so common, between mere hackney-coaches and those termed "glass-coaches." The derivation of the word *coach* has not, however, been itself ascertained, although it has been adopted, with but little variation, in all European languages; nor has it been determined to what nation the invention of this useful luxury belongs, although it has been attributed to the Hungarians, and the name is said to have been taken from the village of *Kotzi*, near Presburgh.

In this country a whimsical etymology has been assigned to the modern ornament of the hammer-cloth. It has been supposed, that, "when coaches were first introduced, our frugal ancestors used to load the carriage with provisions for the family on their journies; the *hamper* covered with a cloth, was both a convenient repository and a seat for the coachman, and this was afterwards converted into a box: *Hammer-cloth* is, therefore, very probably a corruption of *hamper-cloth*." Into the validity of this conjecture it would be futile to enquire; but, whatever may be its merit, it affords, at least, an amusing specimen of the ingenuity exercised by critics in their researches into the perplexities of the *unde derivata*.

COFFEE-HOUSES.

ANTIQUITY OF TAVERNS;—USE OF COFFEE IN THE EAST; —INTRODUCTION INTO EUROPE, AND INTO ENGLAND; —RAINBOW COFFEE-HOUSE;—EARLY PRICES OF COFFEE; — TEA; — POETICAL DESCRIPTION OF ANCIENT COFFEE-HOUSES;—RESTAURATEURS.

In treating this subject, it is not intended to enter upon the history of those houses of general entertainment usually termed taverns, the origin of which may be presumed to be coeval with the first settlement of large cities, and has been traced to those of the ancient Greeks and Romans. Nor would a detailed account of the original establishment of those places of resort, where only the lighter refreshments of tea and coffee are to be procured, repay the trouble of the inquiry; but a brief notice of their introduction into this country may be presumed to merit some attention.

Our knowledge of the early history of the coffee plant is very confined, and, although it is indigenous in Arabia Felix and other parts of the East, the period at which the properties of the berry were first discovered and brought into use is not supposed to have been very remote. Our great Abyssinian traveller, Bruce, tells us, indeed, that the decoction had been drank in Ethiopia from time immemorial; and he says, that some of the wandering tribes even eat the powder, mixed with butter, as a preservative against the effects of fatigue; but it is remarkable, that no mention is made of it in that ancient collection of Eastern tales, so well known under the title of the "Arabian Nights' Entertainments;" from which we may conclude that its qualities were not then known in Persia, although it is to that country that our acquaintance with it is commonly ascribed. From Persia it progressively found its way to the various cities of Syria and Egypt, about the middle of the fifteenth century, and at length reached

Constantinople in the year 1554; whence, at a later period, it was introduced into other parts of Europe.

The earliest account of the use of coffee in this country, is to be found in the "*Athenæ Oxonienses*" of Anthony à Wood,* where it is mentioned, that one Nathaniel Canopius, a native of Crete, and resident in Baliol College, Oxford, which he quitted in 1648, was in the habit of using a beverage called "coffey," which he prepared himself; being the first of that kind, as the ancients of the house declared, that was ever drank in Oxon. From the same author we learn, that—"in the year 1650, Jacob, a Jew, opened a coffey-house at the Angel, in the parish of St. Peter in the East, Oxon; and there it was by some, *who delighted in noveltie*, drank. In 1654, Cirques Jobson, a Jew and a Jacobite, born near Mount Libanus, sold coffey in Oxon; and in 1655, Arthur Tillyard, apothecary, sold coffey publicly in his house against All Soules College. This coffey-house continued till his majesties' returne and after, and then became more frequent, and had an excise set upon coffey."

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* Vol. ii. p. 1140, fol. ed. 1721.

We find it recorded, in "*A New View of London,*" published in 1708, "that one James Farr, a barber, who kept the coffee-house which is now the Rainbow, by the Inner Temple Gate, one of the oldest in England, was, in the year 1657, presented by the inquest of St. Dunstan's in the West, 'for making and selling a sort of liquor called coffee, to the great nuisance and prejudice of the neighbourhood;' and who," adds the author, "could then have thought London would ever have had near three thousand such nuisances, and that coffee would have been, as now, so much drunk by the best of quality and physicians!"

The first mention of coffee, in our statute books, occurs in the year of the restoration of King Charles the Second (1660), but there is ample testimony of its having been in common use within a short period afterwards. Among other authorities, a weekly paper, called "*The Kingdom's Intelligencer,*" published in 1662, contains four advertisements from coffee-houses; one of which, in

December of that year, contains the following notice :—

> “ At the coffee-house in Exchange-alley is sold, by retail, the right coffee-powder, from 4s. to 6*s.* 8*d.* per pound, as in goodness; that pounded in a mortar at 2*s.* 6*d.* per pound; also that termed the East-India berry, at 18*d.* per pound; and that termed the right Turkie berry, well garbled, at 3*s.* per pound, the ungarbled for lesse, with directions, gratis, how to make and use the same; likewise there you may have chocolatta, the ordinary pound boxes at 2*s.* 6*d.* per pound; the perfumed from 4 to 10*s.* per pound; also sherbets, made in Turkie, of lemons, roses, and violets perfumed; and tea, according to its goodness. For all of which, if any gentlemen shall write or send, they shall be sure of the best, as they shall order; and to avoid deceit, warranted under the house seal, *viz.* Morat the Great, &c. Further, all gentlemen that are customers and acquaintance are (the next New-year's-day) invited at the signe of the Great Turk, at the New Coffee House in Exchange-alley, where coffee will be on free cost :—*and so may be to the world's end !*”

The price of tea—or *chaa,* as it is called in some of the advertisements, *tcha* being also the name by which it is known in China—is not mentioned ; but we learn, from other sources, that it was sold, at a still later date, so high as sixty shillings the pound. Of its introduction into Europe we know little more, than the probability of its having been imported into Portugal soon after the discovery of the passage to the East-Indies round the Cape of Good Hope, in 1499; but it was long before it was brought into general use; and its virtues, as a beverage, were at first so little understood, that instances are related of the herb having been served at table as a vegetable, with a sauce of melted butter, the water in which it was boiled being thrown away as useless. It has been generally supposed that it was first brought to this country from Holland, by Lord Arlington, in the year 1666; but the date of the foregoing advertisement sufficiently contradicts the fact, at least in regard to the period.

In the year 1665 there appeared a poem, under the title of "The Character of a Coffee-house: wherein is contained a description of the persons usually frequenting it, with their discourse and humours: as also the admirable vertues of coffee: by an Eye and Ear-witness." It affords a humorous picture of such places, and the frequenters of them at that time, and opens thus:—

" A coffee-house—the learned hold
It is a place where coffee's sold;
This derivation cannot fail us,
For where ale's vended that's an ale-house."

" The gallant he for tea doth call,
The usurer for nought at all;
Pragmatic he doth intreat
That they will fill him some beau-cheat;
The virtuoso cries, 'hand me
Some coffee, mixed with sugar-candy;'
Phanaticus (at last) says, 'Come,
Bring me some aromaticum;'
The player bawls for chocolate:
All which the bumkin wond'ring at,
Cries, 'Ho, my masters! what d'ye speak,
D'ye call for drink in heathen Greek?
Give me some good ale or beer,
Or else I will not drink, I swear.' "

" Of all some, and all conditions,
Even vintners, surgeons, and physicians:
The blind, the deaf, and aged cripple,
Do here resort, and coffee tipple."

Although somewhat foreign to our subject, it may not be uninteresting to some readers to learn the origin of the term *restaurateur*—now so generally applied to the tavern-keepers of the Continent—which is said to have thus arisen: About the year 1765, a Parisian vintner, named Boulanger, first began to supply the public with soups, and other slight refreshments, in the forenoon; and, in order to attract customers, he placed over his door this verse from the Bible: "*Venite ad me omnes qui stomacho laboratis, et ego* RESTAURABO *vos!*" The bait took such effect, that others in the same line of business followed his example; and the restorative powers of their aliments, added to the singularity of the invitation to partake of them, occasioned their being distinguished by an appellation, which has been since indiscriminately applied.

FORKS.

ANCIENT MANNERS; — INTRODUCTION OF FORKS; — CORYAT'S CRUDITIES; — HINTS FOR THE FAIR-SEX; — SPANISH ANECDOTE; — TURKISH, CHINESE, AND ABYSSINIAN CUSTOMS.

MODERN manners have rendered table-forks so necessary among most polished nations, that the mere idea of dining without them excites disgust. Their introduction is, however, of so recent a date, that it can hardly be traced with certainty to three centuries back; and even then they were by no means in general use.

The ancients had not any name for these instruments, and no phrase occurs in their writings which can, with any degree of probability, be applied to them. That they were not known to them, is indeed sufficiently proved by the directions which Ovid gives to his disciples, in the Art of Love, for the delicate use of their fingers in helping themselves:—

> "*Carpe cibos digitis: est quiddam gestus edendi;*
> *Ora nec immunda tota perunge manu.*"
>
> De Art. Amand, lib. iii.

> Your meat, genteely, with your fingers raise;
> And—as in eating there's a certain grace,—
> Beware, with greasy hands, lest you besmear your face.

Our ancestors certainly were unacquainted with the use of table-forks. Their custom was probably the same with that described by Dr. Johnson as having prevailed among the Highlanders of Scotland, so late as the Revolution of 1688; previous to which period every man carried a knife, as a companion to his dagger, with which he cut the meat into small pieces for the women, who put them into their mouths with their fingers; or perhaps the dagger itself, like that of Sir Hudibras,

> ——"Was a serviceable dudgeon
> Either for fighting or for drudging."
>
> *Canto* 1.

It is supposed that forks were in use in Italy towards the close of the fifteenth century. This conjecture is founded on a passage in the life of Corvinus, King of Hungary, written by an Italian who was resident at his court some time between the years 1458 and 1490; in which it is mentioned, that forks were not used at table, *as then in Italy*, but that each person took their meat out of the same dish with the fingers. The author bestows great encomium on his Majesty for not soiling his clothes while eating in this manner: which the courtiers, with all their diligence and attention, were not, he says, able to avoid.

A satiric work, entitled "*L'Isle des Hermaphrodites*," descriptive of the manners of the court of France about the close of the sixteenth century, mentions forks as a luxury only lately introduced; and the author, ridiculing the affected nicety of the innovation, says, that he doubts not but those who adopted it would be glad of an invention which might save them the trouble of chewing. There is still shown, at the castle of Pau, in the Béarnois, a fork which belonged to Henry IV.: it is of steel, two-pronged, and about the size and strength of a stout carving-fork.

So late, indeed, as the year 1608, we find them described, by our countryman Coryat, as a novelty. In his travels, published in 1611, under the quaint title of "*Crudities, hastily gobbled up in five months' travels in France, Savoy, Italy, &c.*" is the following passage, which, from its singularity, we transcribe verbatim:—"I observed a custome in all those Italian cities and townes through the whiche I passed, that is not used in any other countrie that I saw in my travels, neither doe I thinke that any other nation of Christendome doth use it, but only Italy. The Italian, and also most strangers that are commorant in Italy, do alwaies at their meales use a little forke when they cut their meate; for while with their knife, whiche they hold in one hand, they cut the meate out of the dish, they fasten their forke, whiche they hold in their other hand, upon the same dish, so that whatsoever he be that, sitting in the company of any others at meale, should unadvisedly touch the dish of meate with his fingers, from the whiche all the table doe cut, he will give occasion of offence unto the company, as having transgressed the lawes of good manners, insomuch that for his errour he shall be at least browbeaten, if not reprehended in wordes. This forme of feeding, I understand, is generally used in all places of Italy; their forkes being, for the most part, made of yron or steele, and some of silver, but those are used only by gentlemen. The reason of this their curiosity is, because the Italian cannot by any means indure to have his dish touched with fingers, seeing all men's fingers are not alike cleane; thereupon I myselfe thought good to imitate the Italian fashion by this forked cutting of meate, not only while I was in Italy, but also in Germany, and oftentimes in England since I came home; being once quipped for that frequent using of my forke by a certain learned gentleman, a familiar friend of mine, one Mr. Laurence Whitaker, who in his merry humour doubted not to call me at table *furcifer,* only for using a forke at feeding, but for no other cause." This is therefore, unquestionably, the first period of the introduction of forks at our English tables; and that the custom of using them was but slowly adopted, we may infer from a passage in "*The Accomplished Lady's rich Closet of Rarities*," a manual of cookery and manners for the instruction of the fair-sex, published in London in 1653; in which, among other directions for polite behaviour, are the following:—"A gentlewoman being at table, abroad or at home, must observe to keep her body straighte, and lean not by any means upon her elbowes; nor by ravenous gesture discover a voracious appetite; talke not when you have meate in your mouthe; and do not smacke like a pig, nor eat spoone-meat so hot that the tears stand in your eyes. It is very uncourtly to drink so large a draught, that your breath is almost gone, and you are forced to blow strongly to recover yourselfe; throwing downe your liquor as into a funnel is an action fitter for a juggler than a gentlewoman. In carving, at your own table, distribute the best pieces first, *and it will appeare very decent and comely to use a forke,* so touch no piece of meate without it."

Fischer, a late traveller in Spain, says, that even now, in many parts of that country, drinking-glasses, spoons, and forks, are rarities. This, however, is an exaggeration, for throughout that kingdom no decent table is unprovided with them; but the lower orders, it must be admitted, often dispense with their use. It happened to the writer of this article, while travelling some years ago through the province of Andalusia, to have rested at a *venta*, or country inn, which afforded no such convenience. A couple of rabbits,—all the provision the place afforded, —were prepared for dinner, stewed in oil, well seasoned with garlic; but, when placed on the table, it presented neither knife, nor fork, nor spoon. The muleteer who attended, perceiving the embarrassment which this occasioned, first whetted the blade of a huge clasp-knife, which he carried in his pocket, and laid it before him; then tucking up the sleeve of his jacket, and presenting a fist which, probably, had not been washed since the preceding Sunday, he plunged it into the stew, the savoury contents of which he stirred in various directions; and then, seizing the back of the plumpest rabbit, placed it on the writer's plate, with a significant nod, and a cordial "*buen provecho!*"*

The custom of using forks at table is, indeed, even yet far from general. The Turkish inhabitants of the Levant, and all the eastern nations, still serve themselves with their fingers only. The Chinese make use of small sticks, which require considerable dexterity in the management; and a man of fashion in Abyssinia, disdaining the use of either, seats himself, when he dines, between two of his wives, each of whom roll up slices of meat into the form of balls, which they cram into his mouth, as he presents it to them alternately.

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* "*Buen provecho!*" an exclamation, wishing you a good appetite.

FALCONRY.

ANCIENT MODE OF FOWLING, AND OF TRAINING BIRDS OF PREY;—ARABIAN HAWKING; GREEK AND ROMAN; —RISE AND PROGRESS OF FALCONRY IN THE MIDDLE AGES;—INTRODUCTION OF THE HOOD;—PRECEPTS OF DEMETRIUS;—ANTIQUITY OF HAWKING IN GREAT BRITAIN;—GRAND FALCONER;—NATURAL HISTORY OF THE FALCON TRIBE;—KING JAMES'S HAWK;—ANECDOTE.

It seems to be decided among the learned, that the ancient Greeks were unacquainted with the sport of hawking, and that is probably true in the sense in which we now understand it; but although they may have been ignorant of the art of chasing game with hawks trained in the modern manner, it is certain that birds of prey were employed for that purpose at a very early period. Hares and foxes were thus hunted in India;

and Aristotle expressly says, that in that part of Thrace formerly called Cedropolis, birds were caught in the marshes with the assistance of hawks: the men beat the reeds with poles, to raise the game, which, being frightened by the enemy hovering above, fell back to the ground, and were easily taken by the hunters. Another author, of the same date, mentions that the hawks obeyed the call of their keepers, and brought to them what birds they caught, for which they were rewarded with a part. Thus it will be perceived that nothing more is wanting than dogs to find the game, the hood and the jesses of the hawks, to complete the description of modern falconry.

We are told by Ctesias that the Indians trained young eagles, kites, and even crows, to the pursuit of game. They turned out a tame fox or hare, to which a piece of flesh was fastened, and then letting the birds loose, these flew after the animal in order to seize it. Being in this manner instructed to procure their food, they afterwards followed similar wild game, in the hope of finding the same prey; and to encourage them in the chase, they were rewarded with the entrails of what they caught.

Another early writer describes the mode of hawking in Arabia as nearly similar to the modern practice, with respect to birds, but also mentions that it was employed to take game of another description. An Arab mounted on a swift courser, held the falcon on his hand until he perceived the animal which he wished to attack, when it was immediately loosed, and flew directly at the prey, and, darting at the throat, fixed its talons in the flesh while its extended wings flapped over the body and the head. An antelope, thus assailed, bounded twice the height of a man, and freed itself from the gripe of the bird; but was again instantly attacked in the same manner, until the falconer arrived and dispatched it. The falcon was allowed to drink the blood as the reward of his services; and a young bird, in training, was also placed at the throat. In this manner young hawks were taught to fly directly at that part, lest, by fixing themselves on the body, without mortally wounding the animal, they should be carried off to the deserts, and lost to their master; a consequence which would probably ensue, as it is the nature of the bird not to quit its hold until its prey be deprived of life.

As the Greek authors already mentioned were acquainted with the subject, it seems therefore probable that their countrymen must have acquired some knowledge of this method of fowling. It certainly was practised by the Romans, though we are ignorant of the age in which it was introduced; and their acquaintance with it has been doubted, chiefly on the ground of hawks not being enumerated by Virgil among the preparations for hunting at the court of Dido.* It is described by the elder Pliny, and it is repeatedly mentioned during the first centuries of the Christian æra among those sports which were prohibited to ecclesiastics by the mandates of the church; but was afterwards for a long time neglected.

Falconry appears to have attained to perfection, and to have been greatly in vogue at the chief courts of Europe, in the twelfth century. It seems to have been revived in Italy, and its reintroduction is attributed to the Emperor Frederic I., surnamed Barbarossa, who was the greatest sportsman of his time; but Rainaldo, Marquis of Este, was the first Italian prince by whom it was adopted. The introduction into Europe of the improvement of the hood, in the art of training, is due to the Emperor Frederic II., who has left a treatise on the subject, in which he thus mentions it:—"The hood is of Oriental origin, for the Eastern Arabs were the first who made use of it in the taming of falcons, and birds of that species; and, when I crossed the sea, I had myself an opportunity of observing that they employed it in this art. The Kings of Arabia sent their most skilful falconers to me, with various kinds of falcons, and invited, not only from Arabia, but from other countries, those who were most expert in falconry, from whom I received all the information of which they were possessed, and which I had resolved to collect into a book. As the use of the hood was one of the best with which they were acquainted, and I myself witnessed its great utility in the training of falcons, I employed it for that purpose, and it has been so much approved, that it is worthy to be committed to posterity."

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* "*Court of Dido.*" See Art. *Hunting*.

One of the oldest writers on this sport is Demetrius, who was physician to the Emperor Michael Paleologus, about the year 1270. His treatise, which is in Greek, was printed at Paris, with a Latin translation, in 1612, and some other works on the same subject, the antiquity of which is doubtful, were published at the same time; but they consist of little more than directions respecting the rearing and diseases of hawks, and remedies of little value. As a method of taming them, it is recommended that an untractable falcon should be hooded, and confined in a smith's forge, where the noise of the hammers will soon reduce it to obedience. One precept of Demetrius is, we believe, quite obsolete: he recommends sportsmen to say their prayers before they take the field. But Demetrius lived in an age when even freebooters implored the Divine assistance in their predatory expeditions; and, at a much later period, we are told that the most fervent petition of the old Scottish highland chieftains, who partly lived by plunder, was, "Lord! turn the world upside down, that Christians and *honest men* may make bread out of it."

In no country was falconry practised with greater spirit and universality than among the ancient Britons. It commenced, at least, as early as the middle of the fifth century, and was continued until the beginning of the seventeenth, when it seems to have been superseded by the introduction of gunpowder, and the more convenient method of sporting to which it gave rise. We may judge of the degree of consequence attached to the art of falconry, during the zenith of its estimation, from the household regulations of Howel Dha, Prince of Wales, in 942, by which it appears that the grand falconer ranked fourth in the order of precedency among the twenty-four principal officers of the court. When this exalted personage met with any unusual success in his sport, the Prince himself rose to meet him, and, on very extraordinary occasions, even condescended to hold his stirrup;

but all this dignity was not without its attendant alloy; for, lest intemperance should betray him into forgetfulness of his hawks, his potations at the royal table were limited to three draughts of metheglin. At an early period of the English history, similar distinction appears to have been conferred on this amusement by the English court; and, although hawks are no longer kept, the office of grand falconer is hereditary in the family of the Duke of St. Alban's.

The king's falcons were anciently kept where the stables now are, at Charing-Cross; and it was from that circumstance that it derived its name of *Mews*—a term used in falconry—which has since been generally applied to all collections of stabling: the place was appropriated to stables in the time of Edward VI.

There is no sport of the field in which the fair sex have so largely participated as that of hawking. The ladies of former times kept hawks, which were then as much domesticated, and as great favorites, as lap-dogs are now; but, when fire-arms were introduced, ladies abandoned the pleasures of the chase, both because it could no longer be conveniently followed, as formerly, on horseback, and because the use of these weapons was attended with alarm and danger. The custom of carrying a falcon was also generally esteemed as a distinction belonging to superior rank: thus it was formerly a common saying, that "one might know a gentleman by his hawk, his horse, and his greyhound;" and, in fact, persons of that condition usually carried one on the hand. Harold, afterwards King of England, is described, when departing for Normandy, as embarking with a falcon on his hand, and a dog under his arm. Henry II. is represented, at his nuptials, attended by a nobleman with that bird; and, in an ancient sculpture in the church of Milton Abbas, in Dorsetshire, the consort of King Athelstane appears with a hawk on her hand, in the act of tearing his prey.

This diversion was, indeed, among the old English, the pride of the rich, and the privilege of the poor; no rank seems to have been excluded from the amusement, which was equally enjoyed by the feudal baron and his vassal; but we learn from the ancient book of the Abbess of St. Alban's, that every degree had its peculiar falcon. In those days "it was thought sufficient for noblemen to winde their horn, to carry their hawke faire, and leave study and learning to the children of mean people." Such were the accomplishments of the times; and thus Spenser makes his gallant Sir Tristram boast,

> "Ne is there hawke which mantleth her on pearch,
> Whether highe tow'ring or accoasting lowe,
> But I the measure of her flighte do search,
> And all her prey, and all her diet knowe."
>
> Fairie Queene, b. vi., canto 2.

Various species of the falcon genus were employed in hawking; and from the custom of using together some whose lofty flight enabled them to soar above the game, with others which, less aspiring, sailed beneath, and thus prevented all chance of escape, was derived the well-known saying, "between hawk and buzzard." They attacked not only birds of all sizes, but other animals, according to their strength and ferocity; and instances are on record, of children having been carried off by some of the larger species. This has, indeed, occurred twice, at no very distant period, in Scotland; but, on each occasion, they were rescued from the robber's nest without injury. The tribe, including the various kinds of eagle and the osprey, with some improperly termed vultures, is so numerous, that naturalists count no less than one hundred and thirty-six different species scattered over the four continents of the globe, of which, however, only twenty-four belong to this country. The whole race is considered unusually longlived; whence, probably, the allusion of the Psalmist, " thyyouth is renewed like the eagle's." Extraordinary instances are related of the longevity of some; among the most prominent of which is that of a hawk having been taken *at the Cape of Good Hope*, in September 1792, with a golden collar round its neck, on which was this inscription:—

" THIS GOODLIE HAWKE DOTH BELONG TO HIS MOST EXCELLENT MAJESTIE, JAMES, KING OF ENGLANDE. A. D. 1610."

On this curious fact, a correspondent in the Gentleman's Magazine mentions, that he had met with an old manuscript, containing some observations on the migration of birds, in which was the following anecdote:—"And here I call to mind a story of our Anthony Weldon, in his Court and Character of King James: "The King," saith he, "being at Newmarket, delighted much to fly his goshawk at herons; and the manner of the conflict was this: the heron would mount, and the goshawk would get much above it; then, when the hawk stooped at the game, the heron would turn up its belly, to receive him with his claws and sharp bill, which the hawk perceiving, would dodge and pass by, rather than endanger itself. This pastime being over, both the hawk and heron would mount again, to the utmost of their power, till the hawk would be at another attempt, and, after divers such assaults, usually by some lucky hit or other the hawk would bring her down; but, one day, a most excellent hawk being at the game, in the King's presence, mounted so high with his game, that both hawk and heron got out of sight, and were never seen more. Inquiry was made, not only all over England, but in all the foreign Princes' courts in Europe, the hawk having the King's jesses, and marks sufficient, whereby it might be known; but all their inquiries proved ineffectual."

The authenticity of the inscription may, with great probability, be inferred from this anecdote, although it does not mention that the hawk wore a collar; but, as the circumstance is somewhat differently related in Sir Anthony Weldon's work, although it agrees with the chief fact, the disappearance of the birds, we transcribe the passage from his history: *—"The French King, sending over his falconer to shew that sport, his master-falconer lay long here, but could not kill one kite, ours being more magnanimous than the French kite. Sir Thomas Monson desired to have that flight in all exquisiteness,

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* "The Court and Character of King James," by Sir Anthony Weldon, Knt.; ed. 1550, p. 150.

and to that end was at one hundred pounds charge in gosfalcons for that flight; in all that charge he never had but one cast that would perform it, and those that had killed nine kites never missed one. The Earl of Pembroke, with all the Lords, desired the King but to walk out of *Royston* town's-end, to see that flight, which was one of the most stateliest flights of the world, for the high-mountee; the King went unwillingly forth, the flight was shewed, but the kite went to such a mountee, as all the field lost sight of kite, and hawke and all, and neither kite nor hawke were either seen or heard of to this present: which made all the Court conjecture it a very ill omen."

HUNTING.

ANTIQUITY OF HUNTING;—ANCIENT METHODS OF CATCHING GAME; — NETS; — SNARES; — SPANISH MODE OF TAKING THE WILD CATTLE IN SOUTH AMERICA; — HUNTING PARTY OF DIDO AND ÆNEAS;—THE HUNTER-SPRITE;—ANCIENT FOX-HUNTING IN ENGLAND.

THE origin of hunting may be traced to the earliest period of uncivilized society. Nature points out the tenants of the forest to the uncultivated savage as his prey, and necessity teaches him methods for their destruction; even when the arts of industry have provided man with other means of subsistence, and rendered him independent of the chase, the impulse which urged him to it remains, and it is then pursued as eagerly for pleasure, as it was before for food. Thus we find it practised in every age and every clime; and, while other amusements yield to the innovations of luxury, and the caprices of taste, the sports of the field alone remain unfettered by the laws of fashion, and maintain their empire as strongly over the polished generation of the nineteenth century, as over the rudest of their forefathers.

But, if the passion for the chase be universal, the modes in which it is indulged are various. At first, when it was followed for sustenance rather than for sport, little else was considered than the readiest manner of taking the largest quantity of game; for this purpose traps were contrived, and permanent enclosures were formed in the woods, through an opening into which the animals were driven when roused, and there caught. These led to the construction of gins and moveable snares; and it is not improbable that persons who resided on the banks of rivers attempted to catch fish in baskets, with the formation of which, it may be remarked, that most savage nations are acquainted, and thus gradually discovered the method of making nets. Mention is, indeed, frequently made in the Scriptures of nets both for hunting and fishing:* but, although it is clearly proved by some passages that we are *there* to understand such as were knit, yet it is not improbable that gins, composed of cords, are often meant where the translators have introduced nets; and it, doubtless, is to them that we are to refer the metaphorical expressions in which "snares" are so often mentioned. They are, certainly, more ancient than nets; they were long used by barbarous nations, both in hunting and in war, and they are not even yet exploded. Without alluding to the minor engines contrived by poachers for the silent destruction of game, travellers, who have visited South America tell us, that the Spaniard who ranges the plains of Buenos Ayres in pursuit of the wild cattle that feed there in immense droves, relies wholly for success upon the *laso*, which is merely a long cord with a noose at one end, the other being fastened to his saddle-bow, where the rope is coiled. Thus prepared, he chases the herd until he approaches sufficiently near to single one out, over the horns of which he throws the noose; his horse, trained for the purpose, instantly turns short round, and, making a full stand, thus opposes his entire strength to the captive; who, on his part, striving against the power by which he is held, draws in the opposite direction, and is thus, by his own efforts, confined to the spot until the hunter can despatch him.

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* "And I will make thee like the top of a rock; they shall be a place to spread nets upon."

Ezekiel, ch. xxvi., v. 14.

"And it shall come to pass, that the fishers shall stand upon it, from En-gedi even unto En-eglaim; they shall be a place to spread forth nets; their fish shall be according to their kinds, as the fish of the great sea, exceeding many."

Ezekiel, ch. lxvii., v. 10.

We have already seen that birds of prey were trained, at a very remote period, to assist in the destruction of game.* At what time the aid of the dog was first required for the same purpose, must be left to conjecture; but we may presume that the instinct of an animal that has ever lived in social habits with man, could neither have remained long undiscovered, nor, when discovered, unemployed. That they were used in a very early age, not merely singly, but in packs, in the modern manner, is evident from the splendid picture left by Virgil of the hunting-party of Dido and Æneas; and, indeed, the whole description approaches so nearly to the present continental style, and, in some parts, bears so close a resemblance to even an English stag-hunt, that a comparison with a portion of the passage cannot fail to interest those who are conversant with the subject:—

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* See the article *Falconry*.

> "*Oceanum interea surgens Aurora reliquit.*
> *It portis, jubare exorto, delecta juventus:*
> *Retia rara, plagæ, lato venabula ferro,*
> *Massylique ruunt equites, et odora canum vis.*
> *Reginam thalamo cunctantem ad limina primi*
> *Pœnorum expectant: ostroque insignis et auro*
> *Stat sonipes, ac frena ferox spumantia mandit.*"
>
> "*Postquam altos ventum in montes, atque invia lustra;*
> *Ecce feræ saxi dejectæ vertice capræ*
> *Decurrere jugis: aliâ de parte patentes*
> *Transmittunt cursu campos, atque agmine cervi*
> *Pulverulenta fugâ glomerant, montesque relinquunt.*

At puer Ascanius mediis in vallibus acri
Gaudet equo: jamque hos cursu, jam præterit illos:
Spumantemque dari pecora inter inertia votis
Optat aprum, aut fulvum descendere monte leonem."

Æneid, lib. iv.

" The rosy morn was risen from the main,
And horns and hounds awake the princely train:
They issue early through the city gate,
Where the more wakeful huntsmen ready wait,
With nets, and toils, and darts, beside the force
Of Spartan dogs, and swift Massylian horse.
The Tyrian peers and officers of state,
For the slow Queen in anti-chambers wait:
Her lofty courser, in the court below
(Who his majestic rider seem'd to know),
Proud of his purple trappings, paws the ground,
And champs the golden bit, and spreads the foam around."

" Now had they reach'd the hills, and storm'd the seat
Of savage beasts, in dens, their last retreat.
The cry pursues the mountain goats: they bound
From rock to rock, and keep the craggy ground.
Quite otherwise the stags, a trembling train,
In herds unsingled, scour the dusty plain,
And a long chase, in open view, maintain.
The glad Ascanius, as his courser guides,
Spurs through the vale, and these and those outrides
His horse's flanks and sides are forc'd to feel
The clanking lash and goring of the steel,

Impatiently he views the feeble prey,
Wishing some nobler beast to cross his way,
And rather would the tusky boar attend,
Or see the tawny lion downward bend."

DRYDEN.

Many instances might be adduced to show the prevalence of this mode of hunting, at a very distant æra, in the East; and the antiquity of the custom in Europe is sufficiently proved by an ancient legend, which is current among the villagers of Germany and the north of Italy, of an invisible hunter-sprite, who, from time immemorial, has been supposed unceasingly to chase some tyrannical Nimrod of old, whose cruelty occasioned his being transformed into a stag, and thus punished by the *lex talionis*. His halloo! and the baying of his hounds, are often imagined to resound among the mountains of Bohemia and the Tyrol, and many a peasant crosses himself, as he thinks he hears the echo of their din borne by the wind along the lonely recesses of those Alpine solitudes.

The general subject of field-sports is far too extensive to admit of even a pretension to illustrate it by an account of the various modes in which they are pursued in different countries; but the following items of the expenses of the Royal Fox-hunt in the time of Edward I., will shew something of the manner in which that diversion was practised in this country about five hundred years ago, and will afford matter of curious speculation to those accustomed to the numerously composed and splendidly attended packs of the present day:—

	£.	s.	d.
"Paid to William de Foxhunte, the King's huntsman of foxes in divers forests and parks, for his own wages, and the wages of his two boys to take care of the dogs, from Nov. 20th, A.D. 1299, to Nov. 19, A.D. 1300; for each, per day, twopence	9	3	0
"Paid to the same, for the keep of twelve fox-dogs belonging to the King, for the same time; each dog, per day, one halfpenny......	9	3	0
"Paid to the same, the expense of a horse to carry the nets, from Nov. 20th to the last day of April; 163 days, at threepence per day ..	2	0	9
"Paid to the same, the expense of a horse from September 1st, on which day the hunting began, *after the dead season*, to Nov. 19th, at threepence per day	1	0	0
Carried forward........	£21	6	9

	£.	s.	d.
Brought forward	21	6	9
“ Paid to William de Blatherwyck, huntsman of the King's fox-dogs, for winter-shoes for himself and his two boys; to each of them two shillings and fourpence	0	7	0
“ Paid to the same, for his habit during the present year	0	13	4
“ Paid to the same, for habits for his two boys; ten shillings each	1	0	0
	£23	7	1

It will be seen from the above, that our ancestors enjoyed the amusement of fox-hunting on foot, for the charge for a horse is expressly to carry the nets; and considering the vast disproportion between the value of money at that period and the present, we shall find that the expense was not so inconsiderable as it may at first appear. The account is translated from a document, in the department of the Comptroller of the Wardrobe to King Edward I., and is dated in the twenty-eighth year of that monarch's reign. It would appear that William de Blatherwyck and William de Foxhunte were synonimous, and the latter we may presume to have been only a name derived from the office. In the original he is styled *Will'o de Foxhunte.*

HORSE-RACING.

ANTIQUITY OF HORSE-RACING; — INSTITUTION OF THE OLYMPIC GAMES;—STADIUM; — FOOT-RACES; — INTRODUCTION OF HORSE-RACES;—HIPPODROME;—CHARIOT-RACES OF THE GREEKS AND ROMANS; — HORSE-RACES IN MODERN ITALY; — ENGLISH RACERS; — ARABIAN STALLIONS; — KING'S PLATES; — COMMENCEMENT OF HORSE-RACING IN ENGLAND;—NEWMARKET;—RACING ANECDOTES.

THE custom of horse-racing remounts as high as the heroic ages, and although the history of that period is blended with fable, yet the manners may, in a great degree, be learned from the poems of Homer, in whose writings there are frequent allusions to this sport; but the oldest accounts of the manner in which it was conducted, are to be found in the histories that have been transmitted to us of the Olympic games. These were not regularly instituted until the age of Lycurgus, at which epoch Iphitus, a supposed descendant of Hercules, succeeded to the throne of Elis; when, finding the country harassed by the hostile incursions of more powerful states, and being conscious of his inability to defend so inconsiderable a territory by arms, he conceived the idea of protecting it by the shield of religion. With this view he obtained an oracle from Delphi, ordaining that the Olympic games, which had been occasionally celebrated at a former period, should be revived in honor of Jupiter; conferring the superintendence of them upon the Elians; and denouncing the vengeance of Apollo against those who should dare to disturb the tranquillity of that people. In obedience to this command, the games were celebrated at Olympia every fifth year—which term was thence styled an Olympiad—and were continued during several centuries.

The place in which these games were chiefly performed was an enclosed space, of about six hundred and twenty feet, or the eighth of a Grecian mile, in length, and thence obtained the name of *stadium*. On one side were seats for the judges, and on the other for the priestesses of a neighbouring temple of Ceres, who were the only females permitted to be present; indeed, so strict were the Elean laws on this point, that if any woman was found to have even passed the prescribed boundary of the river Alpheus during the solemnity, she was to be thrown headlong from a rock.

The foot-race was, for a long time, the only performance exhibited at Olympia, and this consisted, at first, in merely running from the barrier, above one extremity of the stadium, to the goal, situate at the other; but afterwards, when athletic exercises were introduced, the competitors were required to turn the goal, and run round the stadium eight, ten, and even twelve times. This being the most ancient of the games, the conqueror was always the first to whom a prize was awarded, and he had the exclusive right of conferring his name upon the Olympiad. So highly was this honor valued, and so well were the Greeks acquainted with those who had been victorious in this exercise, that, in fixing the date of events, the ancient historians sometimes only mention the name of him who had obtained the prize, without deeming it necessary to specify the Olympiad.

Chronologers have ascertained, that the first Olympiad occurred seven hundred and seventy-six years before the Christian æra; but the introduction of horse-races, at the games, did not take place until about a century later. The territories of the Grecian States were generally rocky and mountainous, consequently unfavourable to the rearing of horses: at the battle of Marathon, the Athenians appear not to have been provided with cavalry; and it was not until the expulsion of the Persians out of Greece, that they were enabled to assemble three hundred horse. To remedy this defect, by giving encouragement to breeding, those races were established; and so fully did they justify the views of Government, that not only did several hundred horses often contend in the different races at Olympia, but to the influence of these games may, in a great measure, be attributed the subsequent rapid increase of the Grecian cavalry.

The mere horse-races were either performed by single horses, or by a pair, on one of which the rider was mounted during the race, and leaped upon the other at the goal; but the most usual and the most admired mode of contending, was with horses yoked, two or four abreast, in an open car, in which the driver stood erect. The place in which these races were performed was called the *Hippodrome;* it was more than double the length of the stadium, and the number of times which the charioteers had to drive round it rendered the course equal to six Grecian, or nearly five English, miles. This kind of race was attended with considerable difficulty, and even danger; for the number of chariots was generally great, and besides the eagerness with which the drivers endeavoured to turn the barrier as close as possible, in order to lessen the distance, the judges of the games used to employ some means of terrifying the horses, in order to force the proprietors to train them with care. The consequence of this was, that few races were terminated without some accident; and on one occasion we are told, that of forty chariots which started, only one arrived in safety at the goal.

One striking similarity between the conditions of these races and those of modern days was, that the proprietors of the horses were not required to contend in person; and yet, in case of their cattle being successful, they obtained the same honors as those who were victorious in the athletic games. Indeed, so far was this carried, that notwithstanding the prohibition which deprived females of the amusement of witnessing the sports, they were not excluded from becoming competitors in the chariot-races, and the prize was not unfrequently decreed to women.

Among the Romans, " both horse and chariot-races, but especially the latter, were favorite diversions of the people in general; and, in order to enjoy them at their ease, there was an enclosed course immediately adjoining the city, called the *Circus*, although, in point of fact, its form was oval. It was rather more than a mile in circumference; was surrounded with seats in the form of an amphitheatre, and three tiers of galleries; and was calculated to contain at least 150,000, or, as some suppose, more than 250,000 spectators. In the centre, there was a wall twelve feet in breadth, and four in height, round which the race was performed, and at one end, there stood a triumphal arch, through which the successful charioteer drove, amid the plaudits of the assembly. The horses ran to the left, and were restrained by a chain across the goal until the signal was given for starting. The race was generally decided in one heat of five, or sometimes seven times round the course, which, in the latter instance, was a distance of about four English miles. Four chariots usually started together, the drivers of which were distinguished by dresses of different colours, each of which had its partizans, who betted largely on their favorite: for it was neither the charioteer, nor his horses, that interested them, but the colour which they adopted; and so far was this carried, that the people were actually divided into parties, who espoused the pretensions of the different liveries with such warmth, that all Rome was at one time agitated with the disputes of the green and red factions:"

> " The Circus throngs, and—hark! loud shouts arise—
> " From these, I guess the GREEN has won the prize."
>
> *Gifford's Juvenal, Sat. xi.*

"The chariots, as they are usually called, were nothing more than uncovered two-wheeled cars, high and circular in front, and open behind. They were commonly drawn by three or four horses, abreast, which the driver guided in a standing position, with the reins fastened round his body; a custom which occasioned many serious accidents, for, the course being narrow, the turnings sharp and frequent, and both jostling and tossing permitted, the carriages were often overturned."

" We have very little information respecting their jockies; and it is not improbable that their horse-races were commonly run, as in modern Italy, without riders. Mention is, indeed, made of matches in which two horses were rode together by one man; and of some in which the rider leaped, during the race, from the horses on which they were mounted to others which they led: but these appear more like feats of horsemanship than trials of speed." *

The races in modern Italy, to which we have already alluded, are only performed at a few places as an amusement during the carnival. At Rome, they are run in the street called the *Corso*, in which a space is then strongly railed in for the purpose, in a straight line, for the distance of about an English mile. The horses, which are usually of the small Barbary breed, are gaily decorated, but, instead of saddles, there are flaps of leather attached to a surcingle, the under sides of which are studded with sharp points of metal which goad them as they run. A rope is stretched across one end of the course to confine the horses, which are placed with their breasts against it, and on its being withdrawn, they all start off at full speed, and generally perform the distance in little more than two minutes.

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* From "*Sketches of the Domestic Manners and Institutions of the Romans:*" 12mo. p. 126.

For a compendious account of the Olympic Games, see also "*Dr. Hill's Essays on Ancient Greece,*" 12mo. Ess. iv. and v.

In no country has horse-racing been carried to the same extent and perfection as in England; nor is there any breed equal to that of the English thorough-bred horse in the united qualities of strength, speed, and bottom. This unrivalled superiority is, however, due to the introduction of Arabian stallions, by which the breed was crossed, and by which great improvement was effected in the material points of symmetry and speed. The first of these of which we have any account was a horse called the white Turk, which belonged to a Mr. Place, who was stud-master to Oliver Cromwell when Protector; then came Dodsworth, which, though foaled in England, was a natural barb, his dam having been imported when in foal by King Charles II.; after him there was the Lister Turk, brought by the Duke of Berwick from the siege of Buda, in the reign of James II.; and the Byerly Turk, so called from having been a charger belonging to an officer named Byerly, during King William's wars in Ireland. All these, and many others at a later period, were the sires of celebrated racers, whose pedigrees are recorded in the stud-book with greater care than are those of many a noble family in the Herald's College; and so great has been the advantage gained by this admixture of blood, that the present English breed not only equals the Arabian in speed, but far excels it in bottom. It has been asserted, though not positively proved, that the celebrated Childers actually ran a mile in a minute: the same distance has been repeatedly performed by other horses in a few seconds over that time; and the Beacon course, at Newmarket, which is very nearly four miles and a quarter in length, has been gone over in seven minutes and a half.

For the better encouragement of breeding, King's plates have been appointed to be annually run for over various courses, under particular regulations, settled by Act of Parliament. These plates, in fact, consist only in a sum of £100 paid to the winner of three heats of four miles each, but they are eagerly contested, as the weights which the horses are required to carry demand extraordinary power.

The primary qualification of a horse bred for the turf is the purity of his blood, which can only be ascertained by his pedigree; but this being subject to both error and imposition, the test of his blood and qualifications must ever consist in his performance. The material point of judgment, in training, is first to ascertain the speed of the horse, and then the exact weight of which he is master; for it has been demonstrated, upon minute trials, that even the smallest additional weight is of importance; and the most experienced jockies have affirmed, that when two horses are equally matched in age, bone, strength, and speed, seven pounds extra carried by either will make the difference against him of a whole distance, or two hundred and forty yards in four miles. The common racing weights vary, according to age and qualification, from seven to twelve stone, except in matches with yearlings, which are rode by the lightest weight that can be procured, technically termed "a feather;" but the Bibury Club, with a view to excite breeders to pay attention to bone as well as speed, have established plates for horses carrying thirteen stone.

The earliest records of the turf in this country date no farther back than the reign of Charles II., who was extremely attached to the sport, and appointed regular races at Newmarket, which has since become the most celebrated course in Europe. Among the sportsmen of that period, there was a gentleman, who is generally considered as the father of the turf, of whom an anecdote is recorded, which, for the honor of human nature, it is to be hoped may be unfounded,but which is too remarkable to be passed over in silence. He possessed a horse, called Dragon, which was successful in every race in which he was engaged; and having beaten a very celebrated mare, in a match for a thousand guineas, her proprietor declared that she should, the following day, run against any *gelding* in the kingdom, for double the sum. The owner of Dragon instantly accepted the bet; and, it is said, qualified the horse for the condition of the wager, at the starting post, when he was immediately mounted, won the match, and dropped dead at the winning post. This person, Mr. Tregonville Frampton, was keeper of the running horses to William III., Queen Anne, and George the First and Second; and died in 1727, at the advanced age of eighty-six, leaving behind him a large fortune acquired on the turf, and the reputation of being the keenest sportsman of his day: an eulogy which, if the above anecdote be true, few will be inclined to dispute.

The first match upon record, in this country, was one against time, which occurred in the year 1604; when John Lepton, a groom in the service of King James I., undertook to ride five times between London and York, from Monday morning until Saturday night, and actually performed the task within five days.

HORSE-SADDLES.

SUPPOSED SADDLE OF JULIUS CÆSAR;—ANCIENT HOUSINGS;—INVENTION OF SADDLES;—ORIGINAL MODES OF MOUNTING;—ANABOLEI;—FIRST USE OF STIRRUPS.

THERE was formerly preserved at Berne, in Switzerland, and shown to travellers as an object of great curiosity, an old saddle, with stirrups, that was said to have belonged to Julius Cæsar, and to have been used by him in the war in Gaul. It is, however, quite certain that at that period such conveniences were not known. In the earliest ages, the rider sat on the bare back of his horse, and it was only slowly that even a covering of any kind was introduced. This, at first, consisted merely of a piece of raw hide: but in process of time housings were adopted, which nearly covered the animal, and these certainly were used by the Roman cavalry in the time of Cæsar, as he himself tells us that the Germans, who themselves still adhered to the ancient method, held the Romans in some contempt for the adoption of this effeminacy; but Varro, the historian, who lived at a yet later period, boasts of having rode, in his youth, without any covering on his horse. These caparisons, however, and indeed the whole equipment of the horse, at length assumed an appearance of such splendour, as to warrant the description given by Virgil, although not strictly applicable to the æra to which he ascribes it:—

> "*Omnibus extemplo Teucris jubet ordine duci*
> *Instratos ostro alipedes pictisque tapetis.*
> *Aurea pectoribus demissa monilia pendent :*
> *Tecti auro, fulvum mandunt sub dentibus aurum.*"
>
> *Æneid. lib. vii.*

> ———————— "At his command
> The steeds caparison'd with purple stand,
> With golden trappings, glorious to behold,
> And champ betwixt their teeth the foaming gold."
>
> *Dryden.*

The first invention of saddles, in any manner resembling those now in use, is attributed to about the middle of the fourth century, and as the Persians were the first to introduce the housing, it is not improbable that this improvement also may have originated with that people; but the earliest positive mention of them is found in an ordinance of the Emperor Theodosius, in the year 385, prohibiting those who rode post-horses from using saddles *(sellæ)* that weighed more than sixty pounds. This, from its great weight, was probably somewhat similar to our pack-saddle; and it would appear, that every traveller was provided with one of his own, which, it may be remarked, is still customary with the couriers who ride post throughout the Peninsula and in some parts of Italy. In the fifth century, these saddles were so lavishly ornamented, that the Emperor Leo I. found it necessary to issue a decree forbidding the use of pearls and some kinds of rare precious stones in their embellishment; and in the sixth, we find an order of the Emperor Mauritius, that the cavalry saddles should have large coverings of fur.

The invention of stirrups, however, was not coeval with that of saddles. We have here a proof of the error of supposing that things of evident utility for common purposes, must, on that account, be of great antiquity: for, however obvious and necessary the addition of this simple contrivance may now appear, no certain trace of it can be found before the sixth century.

The Greek and Roman youth were taught to vault into their seat, and those of mature age were either assisted by their servants, or used the aid of stepping-stones. These servants, indeed, were not merely employed to lend their aid in the mode that might naturally be supposed, but were required to stoop down, in such manner as that their backs might form a kind of foot-stool for their master; and the name by which they were designated (*Anabolei*) was at one time applied to stirrups, in the same manner as the instrument used for pulling off boots is termed a jack, because it supplies the place of a boy. In proof of this custom, our readers will doubtless call to mind the historical anecdote of the Roman Emperor Valerian, who, when made captive, in the middle of the third century, is said to have been thus degraded by his conqueror, Sapor, King of Persia. Horses were even sometimes trained to kneel until the rider mounted. Horse soldiers, it would appear, were provided with a small projection, or sometimes with a looped strap, on their spears, which they used as a step on mounting.

The first positive allusion to stirrups, that has been noticed, is in a work on the art of war, which has been attributed to the Emperor Mauritius, and is supposed to have been written in the latter end of the sixth century; in which it is said, that a horseman should have at his saddle two iron *scalæ*, a name by which stirrups were afterwards designated. This is repeated in a work on tactics, written by the Emperor Leo VI., three centuries later; but in all the long intermediate period scarcely any mention of them is to be found. Indeed we can collect from Eustathius, the commentator on Homer, that even in the twelfth century they were not common; and for a long time after their first introduction, it was considered manly to dispense with them. We find, however, in an engraving inserted in Montfaucon's "*Monu-*

mens de la Monarchie Française," from an ancient piece of tapestry of the eleventh century, that all the saddles there represented are provided with stirrups. Before this period, and after the humiliating custom of requiring servants to bend as a step had ceased, large metal knobs were affixed to the saddles, by which the rider assisted himself in mounting; and stepping-stones were placed at stated distances on the roads, at the gates of inns and public buildings, and at the doors of most private dwellings.

HORSE-SHOES.

ANCIENT MODES OF SHOEING;—JAPANESE METHOD;—NERO'S MULES;—REMAINS IN THE TOMB OF CHILDERIC;—FIRST MENTION OF IRON HORSE-SHOES;—THEIR INTRODUCTION IN ENGLAND;—FAMILY OF DE FERRERS.

It can be shewn by undoubted evidence, that both the Greeks and Romans endeavoured to secure the hoofs of their beasts of burden from injury by some kind of covering; but the shoes now used for that purpose are certainly of a later invention. Both Aristotle and Pliny mention, that shoes were fastened on the feet of camels during long journeys; but the former calls them by the same name as that employed to designate the sandals of the common people, which were of strong sole-leather. Oxen and mules were furnished with coverings made of a plant resembling hemp, which probably was the kind of rush called by the Spaniards *esparto,* and which is still manufactured into shoes for men in the province of Catalonia, and in other parts of the south of the peninsula. This custom, however, is not peculiar to the ancients; for we learn from various travellers, that at the present day it is usual, when setting out on a journey, in the island of Japan, to provide socks of straw for the horses. These cover the hoof, and are fastened with bands above the fetlock; but as they soon wear out, a large number is required.

The Romans, it is true, shoed their horses with iron; and we even learn from some of their writers, that Nero caused his mules to be shoed with silver, and those of his empress with gold. But, although the information afforded by those authors, is not sufficient to enable us to determine the precise manner in which those shoes were formed, it yet contains enough to warrant the conjecture that they composed a moveable covering for the entire hoof, and were fastened over it by some contrivance with which we are not acquainted. In corroboration of this, we are told by Suetonius, that a driver in the service of Vespasian was delayed upon the road *for the purpose of putting on the shoes of the mules which drew the Emperor's carriage;* and we also find, that this mode of fastening them was so imperfect, as to render them very liable to be lost in stiff ground.

In the year 1653, the tomb of Childeric, King of France, who died in 481, was discovered at Tournay: a gold ring found in it, bearing the name and effigy of the monarch, afforded an undoubted proof of its being the depositary of his remains, and in it there was also a piece of iron, which bore some resemblance to a horse-shoe, and wore the appearance of having four holes on each side; but it was so corroded by the effects of time and damp, that it crumbled to pieces on an attempt being made to clean it, and although an engraving has been made from it, and inserted in Montfaucon's "*Monumens de la Monarchie Française,*" there are doubts of its accuracy.

So far as it has been yet ascertained, horse-shoes, such as are now in use, seem to have been first mentioned in the ninth century, in the work of the Emperor Leo (alluded to in the account of saddles), who calls them σελιναια (*selinaia*), and says, they were to be fastened with nails. The same passage again occurs in the tenth century, in the "*Tactica*" of the Emperor Constantine; and he farther directs a certain quantity of iron to be issued from the public stores to make *selinaia* for the horses in the imperial stable. Considering, therefore, that these were not only formed of iron, and fastened with nails, but that the term itself seems to indicate a moon-like form, we may venture to conclude that the present horse-shoe was known at least as early as the ninth century. Eustathius, indeed, who wrote about three centuries later, has employed the word in this sense in his commentary on the eleventh book of the Iliad; and although it is by no means probable that Homer was acquainted with iron horse-shoes, yet Eustathius no doubt knew that *selinaia* were, in his own time, so understood.

The practice of shoeing horses is mentioned by several writers about the same period; and we are told that when Boniface, Margrave of Tuscany, one of the richest princes of his time, went to meet his bride Beatrice, in the year 1038, his horses were shoed with silver, and nailed with the same metal.

The present custom is supposed to have been introduced into England by William the Conqueror. It is mentioned in Dugdale's Baronetage, that he gave the city of Northampton, as a fief to one of his followers, in consideration of his paying a yearly sum for the shoeing of horses; and that one Henry de Ferrers was appointed superintendent of the farriers, in virtue of which office he bore six horse-shoes on his shield, which are still emblazoned in the armorial bearings of his descendants.

JUGGLERS.

ORIGIN OF JUGGLERS;—SCIENTIFIC EXPERIMENTS;—INVENTION OF THE SOLAR MICROSCOPE: AND OF SPINNING-MACHINES;—PENALTIES AGAINST SORCERY;—LAPLAND WIZARDS;—MAGIC DRUM;—ANCIENT BOOKS ON CONJURATION;—ANTIQUITY OF DECEPTIONS WITH FIRE;—TRIAL BY ORDEAL;—HIRPI;—MODERN FIRE-EATERS;—CUPS AND BALLS;—FEATS OF STRENGTH;—TUMBLING;—ROPE-DANCING AND HORSEMANSHIP;—LEARNED ANIMALS;—DANCING BEARS;—BEES;—DEFORMED PERSONS;—STONE-EATERS.

THOSE occupations which were of the most absolute necessity to the support of existence were doubtless the earliest, and, in the infancy of society, the sole employments that engaged attention. But when the art and industry of a few were found sufficient for the maintenance of many, property began to accumulate in the hands of individuals, and as all could no longer be engaged in the production of the necessaries of life, those who were excluded applied their ingenuity to those arts which, by contributing to the convenience or amusement of the former, might enable them to participate in the fruits of their labour; and several of these have acquired a pre-eminence over the more useful avocations. A taste for the wonderful seems to be natural to man in every stage of society, and at almost every period of life; we, therefore, cannot wonder that, from the earliest ages, persons have been found, who, either more idle or more ingenious than others, have availed themselves of this propensity, to obtain an easy livelihood by levying contributions on the curiosity of the public. Whether this taste is to be considered as a proof of the weakness of our judgment, or of innate inquisitiveness which stimulates us to enlarge the sphere of our knowledge, must be left to the decision of metaphysicians; it is sufficient for our present purpose to know that it gave rise to a numerous class of persons, whom, whether performers of sleight of hand, rope-dancers, mountebanks, teachers of animals to perform extraordinary tricks, or, in short, who delude the senses, and practise a harmless deception on spectators—we include under the common title of Jugglers.

If these arts served no other purpose than that of mere amusement, they yet merit a certain degree of encouragement, as affording at once a cheap and innocent diversion: but jugglers frequently exhibit instructive experiments in natural philosophy, chemistry, and mechanics; thus, the solar microscope was invented from an instrument to reflect shadows, with which a savoyard amused the German populace; and the celebrated Sir Richard Arkwright is said to have conceived the idea of the spinning machines, which have so largely contributed to the prosperity of the cotton manufacture in this country, from a toy which he purchased for his child of an itinerant show-man. These deceptions have, besides, acted as an agreeable and most powerful antidote to superstition, and to that popular belief in miracles, conjuration, sorcery, and witchcraft, which preyed upon the minds of our ancestors; and the effects of shadows, electricity, mirrors, and the magnet, once formidable instruments in the hands of interested persons for keeping the vulgar in awe, have been stripped of their terrors and are no longer frightful in their most terrific forms.

That this superstitious dread led to the persecution of many innocent beings, who were supposed to be guilty of witchcraft, is too well known to require illustration: our own statute books are loaded with penalties against sorcery; at no very distant period our courts of law have been disgraced by criminal trials of that nature; and judges, who are still cited as models of legal knowledge and discernment, not only permitted such cases to go to a jury, but allowed sentences to be recorded which consigned reputed wizards to capital punishment. In Poland, even so late as the year 1739, a juggler was exposed to the torture, until a confession was extracted from him that he was a sorcerer, upon which, without further proof, he was immediately hanged; and instances in other countries might be multiplied almost without end. But this, although it exceeds in atrocity, does not equal in absurdity, the infatuation of the tribunal of the Inquisition in Portugal, which actually condemned to the flames, as being possessed by the devil, a horse belonging to an Englishman who had taught it to perform some uncommon tricks; and the poor animal is confidently said to have been publicly burned at Lisbon, in conformity with his sentence, in the year 1601.

The only part of Europe in which the arts of sorcery now obtain any credit is Lapland; where, indeed, supposed wizards still practise incantations, by which they pretend to obtain the knowledge of future events, and in which the credulity of the people induces them to place the most implicit confidence. On such occasions a magic drum is usually employed. This instrument is formed of a piece of wood of a semi-oval form, hollow on the flat side, and there covered with a skin, in which various uncouth figures are depicted; among which, since the introduction of Christianity into that country, an attempt is usually made to represent the acts of our Saviour and the Apostles. On this covering several brass rings of different sizes are laid, while the attendants dispose themselves in many antic postures, in order to facilitate the charm; the drum is then beat with the horn of a rein-deer, which occasioning the skin to vibrate, puts the rings in motion round the figures, and, according to the positions which they occupy, the officiating seer pronounces his prediction.

It is unfortunate that of all the books (and there were several) which treated of the arts of conjuration, as they were practised among the ancients, not one is now extant, and all that we know upon that subject has been collected from isolated facts which have been incidentally mentioned in other writings. From these it would, however, appear, that many of the deceptions which still continue to excite astonishment were then common.

A century and a half before our æra, during a revolt of the slaves in Sicily, a Syrian of their number, named Eunus, a man of considerable talent, who, after having witnessed many vicissitudes, was reduced to that state, became the leader of his companions by pretending to an inspiration from the gods; and in order to confirm the divinity of his mission by miracles, he used to breathe flames from his mouth when addressing his followers.

By this art the Rabbi Barchochebas also made the credulous Jews believe that he was the Messiah, during the sedition which he excited among them in the reign of Hadrian; and, two centuries afterwards, the Emperor Constantius was impressed with great dread, when informed that one of the body-guards had been seen to breathe out fire. Historians tell us that these deceptions were performed by putting inflammable substances into a nut-shell pierced at both ends, which was then secretly conveyed into the mouth and breathed through. Our own fire-eaters content themselves with rolling a little flax, so as to form a small ball, which is suffered to burn until nearly consumed; more flax is then tightly rolled round it, and the fire will thus remain within for a long time, and sparks may be blown from it without injury, provided the air be inspired, not by the mouth, but through the nostrils. The ancients also performed some curious experiments with that inflammable mineral oil called naphtha, which kindles on merely exposing it near a fire. Allusion is supposed to have been made to this in the story of the dress of Hercules, when it is said to have been dipped in the blood of Nessus. Many authors assert that it was with this substance Medea destroyed Creusa, by sending to her a dress impregnated with it, which burst into flames when she drew near the fire of the altar; and there can be no doubt that it was used by the priests, on those occasions when the sacrificial offerings took fire imperceptibly.

The trial by ordeal, in the middle ages, in which persons accused of certain crimes were forced to prove their innocence by walking blindfold among burning ploughshares, or by holding heated iron in their hands, was probably little else than a juggling trick, which the priests conducted as best suited their views. The accused was committed to their care during three entire days previous to the trial, and remained in their custody for the same space after it was over; the ordeal took place in the church under their own immediate inspection; they not only consecrated, but heated, the iron themselves; mass was then said, and various ceremonies were performed, all calculated to divert the attention of the spectators; and, when the operation was over, the part which had been exposed to the fire was carefully bound up and sealed, not to be opened until the end of the third day: doubtless, therefore, the time before the trial was occupied in preparing the skin to resist the effects of heat, and that afterwards in obliterating the marks of any injury that it might have sustained. That such was the fact has, indeed, been acknowledged in the works of Albertus Magnus, a Dominican friar, who, after the trial by ordeal had been abolished, published the secret of the art, which, if his account be correct, consisted in nothing more than covering the hands and feet at repeated intervals with a paste made of the sap of certain herbs mixed together with the white of an egg.

This deception was, however, practised in times far more remote than the period to which we have alluded. There was anciently an annual festival held on Mount Soracte, in Etruria, at which certain people called *Hirpi* used to walk over live embers, for which performance they were allowed some peculiar privileges by the Roman senate; the same feat was achieved by women at the temple of

Diana, at Castabala, in Cappadocia; and allusion is even made, in the Antigone of the Grecian poet Sophocles, who wrote nearly five centuries anterior to our æra, to the very species of ordeal which has been just noticed.

In modern times, much notice has frequently been excited by jugglers, who practised deceptions with fire. Towards the end of the seventeenth century, one Richardson, an Englishman, excited great astonishment at Paris by pretending to chew burning coals and to swallow melted lead, with many other equally extraordinary feats; some of which are thus recorded in Evelyn's diary:—"October the 8th, 1672; took leave of my Lady Sunderland, who was going to the Hague to my Lord, now ambassador there. She made me stay dinner at Leicester House, and afterwards sent for Richardson, the famous fire-eater. He, before us, devoured brimstone on glowing coals, chewing and swallowing them. He melted a beere glasse and eate it quite up; then taking a live coal on his tongue, he put on it a raw oyster; the coal was blowne on with bellows till it flamed and sparkled in his mouth, and soe remained until the oyster was quite boiled; then he melted pitch and wax with sulphur, which he dranke down as it flamed." Many of our readers must recollect Signora Girardelli; and Miss Roggers, the American fire-eater, who was announced as having entered a heated oven with a leg of mutton in her hand, and having remained there until it was baked! This young lady exhibited all the tricks usually performed by such persons; she washed her hands in boiling oil, and then suffered aquafortis to be poured over them; but below the oil, there, no doubt, was a quantity of water, the air from which, when heated, forcing itself through the supernatant oil, gave it the appearance of boiling, when in reality its temperature probably did not exceed a hundred degrees of Fahrenheit; and when the hands were once well coated with oil, there was no danger from the aquafortis. She had also a ladle of melted lead, out of which she appeared to take a little with a spoon and pour into her mouth, and then to return it in the shape of a solid lump; but in pretending to take the lead into the spoon, it was, in fact, quicksilver that was received, through a dexterous contrivance in the ladle, and this she swallowed, the solid lead having been previously placed in her mouth. She, besides, repeatedly placed her foot on a bar of hot iron; but the rapidity with which she removed it scarcely allowed time to injure the most delicate skin, even had it not been previously prepared: the cuticle of the hands and of the soles of the feet may, however, be easily rendered sufficiently callous to support a longer experiment. This effect will be produced if it be frequently punctured, or injured by being in continual contact with hard substances; repeatedly moistening it with spirit of vitriol will also at length render it horny and insensible; and thus it is not uncommon to see the labourers at copper-works take the melted ore into their hands.

The exhibition of cups and balls is of great antiquity, and depends entirely on manual dexterity. It is mentioned in the works of various ancient authors, one of whom relates the astonishment of a countryman who, on first witnessing the performance, exclaimed, "that it was well he had no such animal on his farm, for under such hands no doubt all his property would soon disappear."

Feats of strength have been common to all countries in every age. More than fifteen hundred years ago there were persons who excited astonishment by the, since ordinary, exhibition of supporting vast weights upon the breast, and of even suffering iron to be forged on an anvil placed upon it. But these are mere tricks: to support the former, it is only necessary to place the body in such a position, with the shoulders and feet resting against some support, as that it shall form an arch; and as for the latter, if the anvil be large and the hammer small, the stroke will scarcely be felt; for action and re-action being equal and reciprocal, an anvil of two hundred pounds weight will resist the stroke of a hammer of two pounds wielded with the force of one hundred pounds, or of four pounds with the impetus of fifty, without injury to the body.

In the beginning of the seventeenth century, there was a German, who travelled over Europe under the appropriate name of Sampson, and who rendered himself celebrated by the uncommon strength which he displayed: among many other extraordinary feats, it is said, that he could so fix himself between two posts, as that two, or even more horses, could not draw him from his position. The same exploit was attempted, not many years back, in this country, by a person who placed himself with his feet resting in a horizontal posture against a strong bar; only one horse was employed, and the man was enabled to resist the entire force of the animal, until both his thigh-bones suddenly snapped asunder. Another had the temerity to try the same experiment, and, in like manner, broke both his legs. These instances clearly show, that apparent strength is often nothing more than a judicious application of the mechanical powers to the human frame; and from the catastrophe attending the two latter may be deduced the anatomical fact, that the sinews of the arms possess a greater power of resistance than the largest bones of the body.

Feats of tumbling, rope-dancing, and horsemanship, were practised at a very early period. Xenophon mentions a female dancer at Athens, who wrote and read while standing on a wheel which revolved with the greatest velocity; but the manner in which this was performed is not explained. Juvenal seems also to have alluded to some similar performance, at Rome, in that passage where he says:

> "*An magis oblectant animum jactata petauro,*
> *Corpora, quique solent rectum descendere funem,*
> *Quam tu.*"———
>
> *Sat. xiv. l.* 265.

which, however, also wants explanation, although one of his most judicious translators has rendered it—

> ——— ———" The man who springs
> Light, through the hoop, and on the tight-rope swings."
>
> *Gifford.*

Addison tells us, that, in his travels through Italy, he witnessed an annual exhibition that is peculiar to the Venetians. "A set of artisans, by the help of poles, which they laid across each others shoulders, built themselves up into a kind of pyramid; so that you saw a pile of men in the air, of four or five rows, rising one above another. The weight was so equally distributed, that every man was well able to bear his part of it; the stories, if they might be so called, growing less and less as they advanced higher and higher. A little boy represented the top of the pyramid, who, after a short space, leaped off, with a great deal of dexterity, into the arms of one who caught him at the bottom." But this was only the revival of an ancient feat, which, as we learn from the following verses of the poet Claudian, was formerly practised among the Romans:—

> "*Vel qui more avium sese jaculantur in auras,*
> *Corporaque ædificant celeri cressentia nexu,*
> *Quorum compositam puer augmentatus in arcem*
> *Emicat, et vinctas plantæ, vel cruribus hærens,*
> *Pendula librato figit vestigia saltu.*"
>
> *De Pr. et Olyb. Cons.*

> "Men pil'd on men, with active leaps arise,
> And build the breathing fabric to the skies;
> A sprightly youth above the topmost row
> Points the tall pyramid, and crowns the show."
>
> *Addison.*

In the thirteenth century, these performances were introduced at Constantinople by a strolling company from Egypt, who afterwards travelled to Rome, and thence through great part of Europe. They could stand in various postures on horses while at full speed, and both mount and dismount without stopping them; and their rope-dancers sometimes extended the rope on which they poised themselves between the masts of ships.

It appears also that the ancients taught animals to perform many of the tricks that are still exhibited, and some even yet more extraordinary. In the year 543, a learned dog was shown at the Byzantine court, which not only selected, and returned to the several owners, the rings and ornaments of the spectators, which were thrown together before him, but, on being asked his opinion respecting the character of some of the females who were present, he expressed it by signs at once so significant and correct, that the people were persuaded he possessed the spirit of divination. In the reign of Galba, an elephant was exhibited at Rome which walked upon a rope stretched across the theatre; and, such was the confidence reposed in his dexterity, that a person was mounted on him while he performed the feat.

It must require the exercise not alone of vast patience, but also of extraordinary cruelty, mingled perhaps with great kindness, to train animals to exhibit a degree of intelligence approaching to that of human beings. It is said that bears are taught to dance by being placed in a den with a floor of heated iron: the animal, endeavouring to avoid the smart to which his paws are thus exposed, rears himself on his hind legs, and alternately raises them with the utmost rapidity, during all which time a flageolet is played to him; and, after this lesson has been frequently repeated, he becomes so impressed with the associated recollection of the music and the pain, that, whenever he hears the same tune, he instinctively recurs to the same efforts in order to escape the fancied danger.

In the middle of the last century, there was an Englishman, named Wildman, who excited great attention by the possession of a secret through the means of which he enticed bees to follow him, and to settle on his person without stinging him. A similar circumstance is related in Francis Brue's voyage to Africa in 1698; in which mention is made of a man who was constantly surrounded by a swarm of these insects, and who had thence obtained the title of "king of the bees."

Only one instance is recorded in ancient history of the art of supplying the deficiency of hands by the use of the toes; and that is of an Indian slave belonging to the Emperor Augustus, who, being without arms, could, notwithstanding, wield a bow and arrows, and put a trumpet to his mouth with his feet.

Of late years some persons have exhibited themselves in the character of stone-eaters; but although these are to be considered as mere jugglers, yet it would appear that there have been others who actually possessed the faculty of digesting similar substances. Of the instances on record we shall merely select one, from the "*Dictionnaire Physique*" of Father Paulian:—"The beginning of May 1760 there was brought to Avignon a true lithophagus, or stone-eater; who had been found, about three years before that time, in a northern island, by the crew of a Dutch ship. He not only swallowed flints of an inch and a half long, a full inch broad, and half an inch thick; but such stones as he could reduce to powder, such as marble, pebbles, &c., he made up into paste, which was to him a most agreeable and wholesome food. I examined this man with all the attention I possibly could; I found his gullet very large, his teeth exceedingly strong, his saliva very corrosive, and his stomach lower than ordinary, which I imputed to the vast quantity of flints he had swallowed, being about five-and-twenty one day with another. His keeper made him eat raw flesh with the stones, but could never induce him to swallow bread; he would, however, drink water, wine, and brandy; which last liquor appeared to afford him infinite pleasure. He usually slept at least twelve hours in a day, sitting on the ground, with one knee over the other, and his chin resting on it; and when not asleep, he passed the greater part of his time in smoking."

In the year 1802, there was a Frenchman, who, indeed, did not profess to eat stones, but who publicly devoured, at the amphitheatre, in the city of Lisbon, a side of raw mutton, with a rabbit and a fowl, *both alive:* he advertised a repetition of the experiment, with the addition of a live cat; but the magistrates, deeming the exhibition too brutal for the public eye, would not again allow of its performance. Notwithstanding that the public display of this man, and the extraordinary fact of his having appeared to swallow living animals, may rank him in the class of jugglers, it is still probable that he was no impostor; for instances of such uncommon powers of the stomach are by no means rare, and, among others, we read of another Frenchman who was in the constant habit, as an amateur, of eating cats alive, and was even strongly suspected of having devoured a child.

LOTTERIES.

ROMAN LOTTERIES;—CONGIARIA;—RAFFLES;—MODERN LOTTERIES;—BLANQUES;—QUEEN ELIZABETH'S LOTTERY;—PROGRESS OF LOTTERIES IN ENGLAND;—LOTTO:—FRENCH NATIONAL LOTTERY;—ORIGIN OF LOTTO.

WERE we to trace the origin of lotteries to the first distribution of property by lot, we should remount to the partition made by Joshua of the land of Canaan among the tribes of Israel. But although it may be said that the principle was then established, the form was not known until towards the close of the Roman republic. It was then the custom, at entertainments given by persons of distinction, to distribute presents by lot among the guests; and this practice was afterwards extended to the public by those who were emulous of popularity, but more especially by the Emperors, by whose orders tickets were scattered among the populace, inscribed with the name of some article which was deliverable to the bearer. This, indeed, was only a more convenient mode of dispensing their bounty, than could have been effected by dividing it on the spot among a numerous assembly, and it wanted that material feature of the modern system, the risk of loss; but Augustus is said to have introduced the custom of selling sealed tablets, apparently equivalent, at an equal price, which when opened, entitled the purchaser to things of very unequal value. These Roman *congiaria*, as they were termed, therefore contained all the principles of our state lotteries; and they are often still more closely imitated in those private lotteries, commonly termed raffles, by which articles of value are disposed of, as well as in those sometimes given at rural fêtes, in which the tickets are distributed gratuitously, and each represents a prize. But the ancients had not attained to the refinement of converting them into a source of emolument, and of encouraging, through them, a passion for gaming in the public, in order to relieve the necessities of the State.

There are, at present, two kinds of games of chance publicly authorized by most of the Governments of Europe; the one known by the name of *Lotto*, the other by that of *Lottery:* both of Italian origin.

It is well known that commerce was understood, and keenly followed in Italy, at a very early period; and it appears that, even in the middle ages, the shopkeepers of that country were in the habit of keeping what they termed "the urn of fortune," in which were a number of tickets inscribed with the names of the several articles in their warehouses, which tickets their customers were allowed to draw for a fixed remuneration, and thus became entitled to whatever each represented. These gradually gave rise to lotteries, in which the prizes were composed of money instead of goods; and the fortunes acquired by those who established them, at length induced some of the Italian States to convert them into a measure of finance. The first of these, of which there is any account, was established at Florence, in 1530, and the price of each ticket was a ducat. Venice and Genoa soon followed this example; and, so early as 1539, the French Government adopted the plan, on the specious pretext that it would put a stop to more pernicious kinds of gambling.

These French lotteries were at first called *blanques*, from the greater number of the tickets drawn being merely blank paper, and consequently not containing any prize. The term *lottery* does not appear to have been introduced, in France, until the year 1658. Some of these were established by individuals for various purposes of public and private interest: one, instituted by the Duke de Nivernois, in 1572, and sanctioned by Pope Sextus V., who promised remission of their sins to the contributors, had the commendable object of providing marriage-portions for destitute young women; and another was set on foot by some ladies to raise a fund towards presenting their confessor, who had been elevated to the dignity of bishop, with a carriage, and other appendages to his new rank—"*pour le remercier, par cette petite largesse, pour le bon ordre qu'il avoit apporté à leurs consciences.*"

The first national lottery in France, upon an extensive plan, was proposed in 1656, but was not drawn until the year 1660, on occasion of the celebration of the marriage of Louis XIV.; the highest prize was 100,000 livres, and was won by the king himself, but his Majesty refused to accept it, and gave the amount to another lottery, in which he had no ticket. This lottery, besides containing the first regular scheme upon the modern system, was farther remarkable for having been planned by the celebrated Lawrence Tonti, a Neapolitan, who afterwards introduced those annuities with benefit of survivorship of which some account will be found under the head of *Tontine.*

Lotteries were also very generally adopted throughout Holland and Germany in the sixteenth century; and one is even said to have been established at Osnaburgh, so early as 1521, but the date seems to rest upon rather doubtful authority.

In England, the first lottery of which there is any record, took place during the reign of Queen Elizabeth; it was held at the west door of St. Paul's Cathedral, and the drawing continued from the 11th of January till the 6th of May 1569. It consisted, indeed, of no less than four hundred thousand tickets, and was, in consequence, nearly two years in filling. The original printed scheme is in the possession of the Antiquarian Society, and from it we learn that the term "lottery" was then in use in this country; it is as follows:—"A proposal for a very rich lottery-general, *without any blanks,* contayning a great number of good prises, as well as of redy money, as of plate and certain sorts of merchandizes, having been valued and prised by the commandment of the Queene's most excellent Majestie's order, to the entent that such commodities as may chance to arise thereof, after the charges borne, may be converted towards the reperations of the havens and strength of the realme, and towards such other good works. The number of lotts shall be foure hundred thousand, and no more; and every lott shall be the sum of tenne shillings sterling, and no more. To be filled by the feast of St. Bartholomew. The shew of prises are to be seen in Cheapside, at the sign of the Queene's Armes, the house of Mr.

Dericke, goldsmith, servant to the Queen, 1567."

In the year 1612, there was a lottery for the benefit of the Virginia Company; but the largest prize was only plate to the value of four thousand crowns, which it appears was gained by a tailor. In 1620, lotteries were suspended, in consequence of a representation from the House of Commons that they were prejudicial to the morals of the nation; but they were afterwards permitted by a special license from King Charles I., in aid of the expenses of a project for conveying water to London. The first mention of them in our statute books occurs in 1630.

In the reign of Charles the Second, one of the methods resorted to by that monarch to reward the officers who had remained faithful to his cause, was to give them grants of plate and other valuables, with permission to dispose of them by a lottery. This gave rise to various schemes, under the titles of royal-oak, and twelve-penny lotteries, &c.; which were sanctioned by Government, as we learn by the following advertisement, which appeared soon after the Restoration:—"This is to give notice, that any persons who are desirous to farm any of the counties within the kingdom of England or dominion of Wales, in order to the setting up of a plate lottery, or any other lottery whatsoever, may repair to the lottery office, at Mr. Philips's house in Mermaid-court, over against the Mews, where they may contract with the trustees commissioned by his Majesty's letters patent for the management of the said patent, on behalf of the truly loyal indigent officers."

During the reign of Queen Anne, the lotteries were commonly for terminable annuities, to which both blanks and prizes became entitled at different rates: thus in 1710, the lottery consisted of 150,000 tickets, valued at £10 each; every ticket being entitled to an annuity for thirty-two years, the blanks at fourteen shillings per annum, and the prizes to various annuities, from five pounds to one thousand. Tickets appear to have been first divided into shares during the administration of Sir Robert Walpole; and from that time to the present, lotteries have been continued with but little intermission.

Lotto, which is an ancient Genoese invention, does not consist, like the lottery, of a fixed number of tickets, and a certain amount of specified prizes, but is, in fact, a mere game of chance, at which the stakes are indefinite; and is thus played. A given quantity of numbers are placed together, of which a few only are to be drawn: the adventurers then select any one, or more, on which they bet such a sum as they think proper; and, should they prove successful, they draw so much more than their stake, in a settled proportion, according as their risk was increased by the quantity of numbers which they named together. Thus, the usual quantity is ninety numbers, from one upwards, and of these only five are drawn: if the adventurer chooses but *one* number out of the ninety, and that it be one of those drawn, his stake is returned fifteen fold; if *two*, he receives, if they be drawn, 270 times the stake; if *three*, 5,500 times; if *four*, 75,000 times; and should he name the *entire five, in the exact order in which they happen to be drawn*, he is entitled to one million times more than the stake he ventured. These chances are all calculated largely in favor of the banker, or holder of the lotto, and there is no instance upon public record of any person having named the five numbers in regular succession; but three have been frequently fixed upon, and even four have been sometimes, though rarely, attained: By the latter chance a lotto established in 1774, at Neufchatel, was ruined.

This game has been adopted, since the revolution in France, by the Government of that country, as a source of national revenue. Stakes are accepted so low as a single franc; and as it is drawn every month, in one or other of the departments, and bureaux are opened all over the kingdom to receive deposits, it may be easily conjectured what an incitement it affords to the passion of gambling among the lower orders, and how largely it must benefit the coffers of the state.

The origin of lotto has been ascribed to the manner in which the members of the senate of Genoa were anciently elected. The names of the several candidates were put into a kind of wheel, called a *seminario*, from which they were drawn as chance directed, and bets were commonly laid respecting those who might be successful. One Benedetto Gentile, a Genoese nobleman, taking advantage of this circumstance, opened a bank for taking these bets from the public at a fixed rate: this plan was afterwards adopted by the state itself; and the transition from the names of the candidates to numbers easily followed.

This Signor Gentile suddenly disappeared; and as the ticket on which his own name was inscribed by some accident had never been drawn from the seminario, the people were persuaded that the devil had carried off both it and himself as a punishment for his invention. Had they said that he deserved it, few would have doubted the justice of their decision.

> " Si son exécrable mémoire
> " Parvient à la posterité,
> " C'est que le crime, aussi bien que la gloire,
> " Conduit à l'immortalité."

MUSEUMS.

ANTIQUE COLLECTIONS OF NATURAL CURIOSITIES;—HIPPOCENTAUR;—MUSEUM OF THE EMPEROR AUGUSTUS;—ANCIENT MODES OF PRESERVING PERISHABLE SUBSTANCES; — EGYPTIAN METHOD OF EMBALMING; — CERE-CLOTHS;—REMAINS OF KING EDWARD I.—MENAGERIES;—ORIGIN AND PROGRESS OF MODERN CABINETS OF CURIOSITIES;—MUSEUM TRADESCANTINUM;—KEMP'S MUSEUM;—BRITISH MUSEUM.

NATURAL productions of uncommon form or beauty, and other rare objects, were in the earliest ages consecrated to the gods, and there is reason to suppose that the first collections of natural curiosities were preserved in the temples. There they were guarded with a pious reverence which secured them from neglect, and, being handed down to succeeding generations, they at length accumulated to an amount that may be considered large in the then infant state of natural history. Some account of these has occasionally been recorded, and a brief enumeration of a few among them may not prove wholly uninteresting.

Amongst other curiosities, the temple of Juno, at Carthage, contained the skins of two of the hairy women discovered by Hanno on the Gorgades Islands, and which he deposited there, on his return, as a memorial of his voyage:—

The enormous horns of the wild bulls, which committed such havoc in Macedonia, were hung up by order of King Philip in the temple of Hercules; and in the temple of Delphi there were suspended the horns of a Scythian animal, in which the Stygian water that consumed every other vessel could be contained: these were presented by the Emperor Alexander, and the inscription by which they were accompanied has been recorded by Ælian:*—

In the temple of Hercules, at Erythris, were the horns of the supposed Indian ants; and in that of Isis, at Cæsarea, the skeleton of the crocodile that was found in the attempt to discover the sources of the Nile:—

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* Ælian: *Hist. Animalium, lib. x. cap.* 40.

The skin of the serpent destroyed by the Roman army in Africa during the first Punic war, and which both Pliny and Valerius Maximus describe as being 120 feet in length, was hung up in one of the temples at Rome, where its jaw-bones remained until more than a century afterwards :*—

In the temple of Juno, in the island of Melita (*Malta*), a pair of elephant's teeth, of monstrous size, were deposited; and these having been carried away by the admiral of Massanissa's fleet, were afterwards restored on its being found that they belonged to a sacred place :—

In one of the temples of Diana, the head of a basilisk was shewn; and the bones of that sea-monster to which Andromeda was supposed to have been exposed, were preserved at Joppa, whence they were afterwards carried to Rome :—

The hide of the celebrated Calydonian boar was exhibited in one of the temples of Greece, in the time of Pausanius; and the huge tusks of the animal were afterwards brought to Rome, by order of the Emperor Augustus, and placed in the temple of Bacchus.

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* Plin. *Hist. Nat. lib. viii., cap.* 12. Valer. Max., *lib. i. cap.* 8.

But the most extraordinary of all was, doubtless, the hippocentaur, which is mentioned by several writers, and which, as we are assured by Pliny, the naturalist, was preserved, *in his time*, in the cabinet of the Emperor. The animal was said to have been caught in Arabia, and to have been brought to Egypt, where having died, it was preserved in brine, and transmitted to Rome. To those who, notwithstanding the authority of this respectable author, may still be inclined to consider the existence of such a creature as fabulous, it may be observed, that St. Jerome, who wrote in the fifth century, also mentions another hippocentaur, in his life of Paul, the hermit; in which he describes the monster, and says that it was notorious to the whole world that, in the reign of Constantine, it was brought alive to Alexandria, where it was publicly exhibited, and on its death was preserved in salt, and sent to the Emperor at Antioch.

These curiosities were, however, rather

kept in the temples as public memorials, or relics of ancient times, than to serve the purposes of science; and it does not appear that the learned among the ancients formed private collections of their own. The Emperor Alexander, indeed, ordered all huntsmen, fowlers, and fishermen, to send whatever rare animals they obtained to Aristotle; and we know that Pliny took every opportunity to procure rare productions of nature, in order to note their peculiarities; but still we hear of nothing like a museum of natural curiosities until the time of the Emperor Augustus, who, as we are informed by Suetonius, had one in his palace.

One of the chief causes, no doubt, that rendered such collections rare among the ancients, was the imperfect knowledge they possessed of the mode of preserving those objects that were subject to decay. The only methods with which they were acquainted, were those of immersion in brine, or in honey, or of covering with wax, all of which were defective, and far inferior to that by spirits of wine, which combines the advantage of preventing putrefaction with that of perfect transparency. The more scientific modern process employed in anatomical preparations was wholely unknown.

Of the methods then in use to prevent corruption, that by means of salt was the most ancient, as it certainly was the most apparent, and the easiest of execution. It has been supposed to have originated in Persia; and we have the authority of Dion Cassius, that when Pharnaces sent the body of his father, Mithridates, to Pompey, he had it placed in brine: but it seems probable that, in the East, nitre was more frequently employed for this purpose than common salt. At a later period, we learn that the heads of the early martyrs were preserved in salt by the monks; and Sigebert, who died in 1113, tells us that a similar process was used with the body of St. Guibert.

The custom of preserving dead bodies in honey was also employed at a very early period. The remains of several of the Spartans who died in foreign countries were thus prepared for transmission to their native home. The body of Alexander the Great is also said, by some authors, to have been thus deposited, although we are told by others that it was embalmed in the manner of the Egyptians; and so late as the latter end of the sixth century, that of the dethroned emperor, Justin, was laid in honey mixed with spice.

The Egyptian method of embalming consisted in first extracting the brain through the nostrils, and injecting some viscous unguent in their stead; then opening the belly, and taking out the intestines, the cavity being washed with palm-wine impregnated with spices, and filled with myrrh and other aromatics; this done, the body was laid in nitre during seventy days, at the end of which it was taken out, cleansed, and swathed in fine linen, which was gummed and ornamented with various painted hieroglyphics expressive of the deceased's character and rank. When this process was completed, the body was deposited in a narrow coffin enclosed in an outer case, and placed upright against the wall of the mausoleum of the family. It was in this manner that the mummies which have been preserved to the present time were preserved; but it was only employed for persons of the highest distinction. Another less expensive method was by injecting a dissolvent into all the cavities of the body; this, after a short time, carried off, in a liquid state, whatever it contained, and the body, thus purified, being dried by the nitrous process, was then swathed in the manner already mentioned: the poor merely drenched the body with injections, and afterwards dried it in nitre.

This invention is universally ascribed to the Egyptians; and the account communicated to us in the Mosaic writings of the embalming of the patriarch Jacob, sufficiently proves the antiquity of the custom, and confirms the common opinion:* but the period of the operation is there limited to forty days, while the mourning is said to last seventy.

Among the nations of the east, dead bodies were sometimes covered over with wax;

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* "And Joseph commanded his servants, the physicians, to embalm his father: and the physicians embalmed Israel."

"And forty days were fulfilled for him (for so are fulfilled the days of those which are embalmed); and the Egyptians mourned for him threescore and ten days."

Genesis, c. l., v. 2 and 3.

and this practice, which was early introduced into Europe, gave rise to that of wrapping the remains of persons of distinction in waxed cloth, which has been continued down even to the present day. Of this the annals of this country present numerous instances. In that ancient record, the *liber regalis,* we find directions, " that the remains of the kings of England shall be enfolded in waxed linen; but in such manner as that the face and beard may be discernible, and that each finger be separately covered." Accordingly, when the tomb of Edward the First, who died in 1307, was opened in 1774, the body was found thus enveloped, and the form of the features and the hands were still clearly distinguishable. The body of Johanna, mother of Edward the Black Prince, was also, as we are told, " *wrapped in cere-cloth*;" and that of Elizabeth Tudor, second daughter of Henry VII., " *was cered by the wax-chandler.*" Among the funeral charges of George II. is one for cere-cloth, and more recent examples must be in common recollection.

However these various modes of conservation may have been applied to scientific purposes during the reign of the Roman emperors, no trace of such an application can be discovered in the darkness of the middle ages; but in the treasuries of princes there were sometimes found, among antiquities and curiosities of art, a few specimens of the dried and stuffed remains of uncommon animals. When commerce had extended the intercourse between nations, these collections were enlarged: menageries were also formed to add to the splendour of courts;* and while these diffused a knowledge of foreign productions, they also excited curiosity, and a taste for more minute inquiry into the peculiar qualities of their various contents. As literature revived, public libraries were established, and became receptacles for such natural curiosites as were occasionally presented to them; and in universities, the faculty of medicine collected, for dissection, various objects from the animal kingdom, as well as human bodies, and preserved the parts in spirits of wine. At a still later period, wealthy individuals began to form collections of curiosities, at first, probably, more calculated to please the eye than to gratify the understanding; but these, as science became at once more extended and more defined, were classed in distinct departments, and hence have arisen the various cabinets of natural curiosities now to be found in every part of the civilized world. The earliest of these private collections, however, is not supposed to date farther back than some time in the sixteenth century; and the oldest known catalogue, upon any systematic plan, is that of John Kentmann, a learned physician of Torgau, in Saxony, which was published in 1565. It consisted chiefly of minerals and other fossil productions; and although it only contained about sixteen hundred articles, it was then esteemed considerable, and cost, as the collector tells us, "sums which few could afford to expend."

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* So early as the reign of Edward II. the Sheriffs of London were commanded to pay the keepers of the King's leopards, out of the fee-farm of the City, sixpence a day for the sustenance of the animals, and three-halfpence a day for the diet of their keeper; and that part of the Tower of London appropriated to the wild beasts was built for that purpose in the reign of Edward IV.; but there was a menagerie there even in the reign of Henry III., to whom the Emperor of Germany, in 1235, sent a present of three leopards, which were kept in the Tower.

The first museum in this country was formed towards the middle of the seventeenth century, by John Tradescant,* who procured the objects of which it was composed, in many parts of Europe, America, and the Levant. His collection of coins and medals appears to have been valuable; but among the natural curiosities mentioned in the catalogue, which has been published under the title of "*Museum Tradescantinum*," are some that are not calculated to afford a very high idea of the science or the discernment of the collector; for we find an egg of a *griffin*, and another of a *dragon;* some feathers from the tail of a *phœnix;* and the claw of a *ruck*, "*a bird able to trusse an elephant;*" together with others of a similar nature. After Tradescant's death, which occurred in 1652, this cabinet was presented, by his son, to the celebrated Elias Ashmole, who removed it to Oxford, where it forms a part of the Ashmolean Museum.

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* "*John Tradescant.*" For some further particulars respecting this person, see the article *Flower-Gardens.*

The next in order of time was Kemp's Museum, which was open to public inspection, in the Haymarket, in the beginning of the last century. It was originally founded by Mr. John Conyers, a well known antiquary; and among a great variety of Egyptian, Greek, and Roman antiquities, both natural and artificial, contained the skeleton of an elephant which was dug out of a gravel-pit in the neighbourhood of London, in 1689: it was supposed to have lain there since the time of the Romans, for a battle is recorded to have been fought near the spot in the time of Claudius; and in the same pit the head of a British spear was found, made of flint.

The splendid collection contained in the British Museum was founded in 1753, by Sir Hans Sloane, and was purchased by Parliament for the national use, for the sum of £20,000. To this was afterwards added the Harleian collection of manuscripts, the Cottonian library, and that of the King, with other large additions, the Etruscan vases and other antiquities belonging to the late Sir W. Hamilton, and the Grecian marbles selected by Lord Elgin; which being now arranged together, form one of the most valuable cabinets of literature and science in all Europe.

NEWSPAPERS.

ANCIENT MODES OF CONVEYING INTELLIGENCE;—ACTA DIURNA OF THE ROMANS;—REGISTER OFFICES;—ORIGIN OF NEWSPAPERS IN ENGLAND;—PARAGRAPHS IN QUEEN ELIZABETH'S PAPER;—DIURNALLS DURING THE CIVIL WARS;—EXTRACTS;—LONDON GAZETTE;—LONDON CHRONICLE;—ST. JAMES'S CHRONICLE;—WEEKLY CIRCULATION OF ENGLISH PAPERS;—FOREIGN JOURNALS;—MONITEUR UNIVERSEL.

THE oldest method of conveying intelligence, with which we are acquainted, was by means of public criers. These, among the Greeks and Romans, were under the superintendance of the police, and were generally employed by individuals in the same manner as they still are in our country towns. Another mode, also, was to post up a written advertisement against a column in some public place; this was resorted to by the Roman government to promulgate its edicts, and even, it is supposed, for imparting more trivial information of general import. Historians appear to have collected materials from them: nor is it improbable, that copies were taken by individuals, and dispersed about the city, or sent to their friends in the provinces. The following extracts from one of these ancient gazettes, then termed *acta diurna*, may not prove unentertaining to the English reader, as they serve to show how nearly a Roman newspaper ran in the style of a modern one; except, indeed, that the editors seem to have been deficient in several material ornaments of style; they never ended an article with the mystical hint, "*this occasions much speculation*;" they seem to have been ignorant of such equivocal introductions as "*we hear it is strongly reported*;" and were entirely unacquainted with the ingenious modern excuse for a downright lie, "*this wants confirmation.*"

A. U. C. DLXXXV.* *Fourth of the kalends of April.*
The fasces with Licinius, the consul.

"It thundered, and an oak was struck with lightning on that part of Mount Palatine called Sumina Velia, early in the afternoon."

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* A. U. C. *anno urb. cond.* DLXXXV., *i. e.* in the 585th year from the building of Rome.

"An affray happened in a Tavern, at the lower end of the Banker's Street, in which the tavern-keeper was dangerously wounded."

"Tertinus, the Ædile, fined the butchers for selling meat which had not been inspected by the overseers of the markets: the fine is to be employed towards building a chapel to the temple of the goddess Tellus."

Third of the kalends of April.

The Fasces with Æmilius.

"It rained stones on Mount Veintine.

"Posthumius, the Tribune, sent his beadle to the Consul, because he was unwilling to convene the senate on that day; but the Tribune Decimus putting in his veto, the affair went no further."

A. U. C. DCXCI. *Third of the Ides of August.*

Syllanus and Murena, Consuls.

The Fasces with Murena.

"Murena sacrificed early in the morning at the temple of Castor and Pollux, and afterwards assembled the Senate in Pompey's Senate-house."

Fifth of the kalends of September.

The Fasces with Syllanus.

"M. Tullius Cicero pleaded in defence of Cornelius Sylla, accused by Torquatus of being concerned in Catiline's conspiracy; and gained his cause by a majority of five judges."

"C. Cæsar set out for his government in Farther Spain, having been long detained by his creditors."

"The funeral of Metella Pia, a vestal, was celebrated; she was buried in the sepulchre of her ancestors, in the Aurelian road."

On the introduction of the Christian worship, in its present form, the custom was devised of announcing information that was thought important to the congregation, either by a notice on the church door, as still practised, or, in still earlier times, from the pulpit.

Subsequent to this mode, offices were established for the communication of the private wants of individuals, in the form of a register. This first took place in France about the middle of the sixteenth century, in consequence of a plan proposed by the father of the celebrated Montaigne; and this led to the publication, in that country, of advertisements, which from having been sometimes pasted against the walls, gave the name of *affiches* to the papers which contained them.

In England, the first example that occurs of a newspaper was a publication established by Queen Elizabeth, at a moment of great difficulty and danger, in order to communicate such intelligence as she felt interested in making known, and counteracting such rumours as her enemies were anxious to propagate.

Of this publication three printed numbers are preserved in the collection of State Papers in the British Museum: the earliest is No. 50, dated July 23, 1588: it is entitled, "*The English Mercurie published by authoritie for the contradiction of false reports,*" and is said, at the end, to be "imprinted by Christopher Barker, her Highness's printer." It would appear not to have been published at regular periodical intervals, but as occasion required, or events of importance occurred. The first article in No. 50, dated from Whitehall, contains advices from Sir Francis Walsingham, that the Spanish Armada was seen in the chops of the channel, making for the entrance with a favourable gale. An account is then given of her Majesty's fleet, which consisted of eighty sail, divided into four squadrons, commanded by the Lord High Admiral, in the *Ark-Royal*, Sir Francis Drake, Admirals Hawkins and Frobisher. By the best computation, it is added, the enemy could not have fewer than one hundred and fifty ships; but as soon as they were seen from the topmasts of the English fleet, instead of exciting any fear of the result, they were hailed by the sailors with acclamations of joy. An account is then given of the attack made on the Armada on the 21st of July; after which it fled. This official article goes on to state, that such preparations were made not only at Tilbury and Blackheath, but all along the coast, that nothing was to be feared should the Spaniards even effect a landing; it concludes thus:—"By God's blessing there is no doubt but this unjust and daring enterprize of the King of Spayne will turn out to his everlasting shame and dishonour, as all rankes of the people, without respect of religion, seem resolute to defend the sacred persone of their sovereigne, and the lawes and liberties of this country against all foreign invaders."

Under the head London, July 23, there are the following paragraphs:—

"The Lord Mayor, Aldermen, Common Council, and Lieutenantcie of this greate city, wayted upon her Majestie at

Westminster this afternone, with assurances of their hearty and unanimous resolution to stand by and support her Majestie, at this critical juncture, with their lives and fortunes, when her invaluable life, the true Protestant religion, and all the privileges of freeborn Englishmen, are threatened by an attack from our bigotted and bloode-thirsty adversaries, the Spaniards.

"The Queen received them very graciously, and assured them that she did not doubte their zealous endeavours to serve their sovereigne on the present very important occasion; that for her part, she relyed on God's Providence and the goodnesse of her cause, and was resolved to run all risques with her faithful subjects."

"Yesterday the Scotch Ambassador had a private audience of her Majestie, and delivered a letter from the king, his master, contayninge the most cordial assurances of adhering to her Majestie's interests, and to those of the Protestant religion: and the younge king sayd to her Majestie's minister at his court, that all the favour he expected of the Spaniards was, the courtesie of Polyphemus to Ulysses, that he should be devoured the last."

No. 51, dated Whitehall, July 26, contains—"The journal of what passed since the 21st of this month between her Majestie's fleet and that of Spayne, transmitted by the Lorde Highe Admirall to the Lordes of the Councill." Also,

"A letter from Madrid, dated the 16th

July,* details 'the hopes of Spayne in the Armada expedition.' "

The next number in the collection, being 54, is dated Nov. 24, an interval of four months. It contains an account, under the head of London, of "the solemn general thanksgivinge for the successes obtayned against the Spanish Armada." Her Majesty went in state to St. Paul's: she dined at the deanery, and rode back to Whitehall by torch-light.

From the time that this publication was given up, we find no continued vehicle for political intelligence, with a fixed title, for many years. In the reign of James I. packets of news were published, in the shape of small quarto pamphlets, as they arrived. These were entitled, "Newes from Italy, Hungary, &c." as they happened to refer to the transactions of those respective countries, and generally purported to be translations from the low Dutch. In the year 1622, when the thirty years' war, and the exploits of the great King Gustavus Adolphus, excited curiosity, these occasional pamphlets were converted into a regular weekly publication, entitled "*The newes of the present week*," edited by Nathaniel Butler; which may be deemed the first journal of the kind in England.

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* If the date of this letter was correct, it would appear, from a comparison with that of the newspaper in which it was published, that intelligence was then obtained from the interior of Spain with as much celerity as by the couriers of the present day.

No discussion could, of course, exist, nor could any news but such as pleased the government be communicated, when the Star-Chamber and High Commission Courts exercised an uncontrolled sway over the liberties and the ears of authors, and frequent proclamations were issued forbidding the people even to converse on political subjects. At that time, besides, there was neither a very general demand for information on such topics, nor a convenient post communication.

In the time of the civil war, newspapers multiplied to a great extent, and whole flights of *Diurnalls*, as they were then called, or rather of "Mercuries," for that was the favorite title, were weekly despatched with royal or parliamentary intelligence. In the course of the year 1643 alone, nearly a score of papers were started, many of which have been preserved. Among them are the following titles:—"*Special Passages, or certain Informations*;—"*England's memorable Accidents*;"—"*Diurnal of certain passages of Parliament*;"—"*Mercurius Aulicus*;"—"*The Kingdome's Weekly Intelligencer*;"—"*Mercurius Civicus, or London's Intelligencer*;"—"*The Parliament's Scout's Discovery, or certain Information from both Armies*;"—"*Mercurius Rusticus, or the Country's Complaint of the Robberies, Plunderings, and other Outrages committed by the Rebels on his Majesty's faithful Subjects*;"—"*Mercurius Britannicus*," a parliamentary paper;—the "*Weekly Account*;"—the "*Welsh Mercury*;"—and the "*Scotch Intelligencer*." These were mostly weekly papers. The "Mercurius Aulicus" was first published at Oxford, in January 1643, to counteract the alleged falsehoods of the Roundheads, or partizans of the Parliament. This purpose is expressed in the introductory paragraph, which begins thus:—

"The world hath long enough been abused with falsehoods; and there's a weekly cheat put out to nourish the abuse among the people, and make them pay for their seducement. And that the world may see that the court is neither so barren of intelligence as it is conceived, nor the affairs thereof in so unprosperous a condition as these pamphlets make them, it is thought fit to let them truly understand the state of things, that so they may no longer pretend ignorance, or be deceived with untruthes; which being premised once for all, we now go into the businesse, wherein we shall proceed with all truth and candour."

In the *Welsh Mercury*, of Oct. 21st 1643, we find the following *jeu d'esprit* :—

" Her do hear for certain that the Scots are in a chearful readiness to advance forward to England; which her countrymen do like very well, and will join with her in footing of a northern jig, while harmonie's money doth lead the morris-dance; which is better musick than all her Welsh harpers :—

When pay-day comes the soldier drinks and sings:
There is no musick without silver strings.

But her shall have much to do with Mr. Blue-cap when her comes into England, with her creat thousands of men; but her have a plot beyond her northern wit; for her have a project to press all her countrymen that are under ground, and do live in her mountains; which are a people called the Echoes. Her asked her, t'other day, if her stood for the King? and her answered, "*the King.*" Then her asked, if her stood for the Parliament? and her replied, "*for the Parliament.*" So that her be no delinquent that doth stand for the King and the Parliament; and therefore, her will come with an army of echoes and voices that shall cry, *vivey le Roy, et le Parliament.*"

And, in "*Poor Robin's Intelligence,*" in 1676, we read this advertisement:—

"A maid-servant to be hired, either weekly, monthly, or quarterly, for reasonable wages; one that is an incomparable slut, and goes all the day slip-shod with her stockings out at heels; an excellent housewife, that wastes more of every thing than she spends; an egregious scold, that will always have the last word; an everlasting gossip, that tells abroad whatsoever is done in the house; a lazy trosses, that cares not how late she sits up, nor how long she lies in the morning; and, in short, one that is light-fingered, knowing nothing, and yet pretending to every thing."

Dr. Johnson giving an account, in his "Life of Addison," of the commencement and original character of this species of publication, which like its cotemporary and constant companion, a tea breakfast, has almost now become a necessary of life, and speaking of the "Mercurius Aulicus," and other remarkable papers of that period, says that, "when any title grew popular, it was stolen by the antagonist, who by this stratagem conveyed his notions to those who would not have received them had he not worn the appearance of a friend." Those Mercuries were succeeded by "*L'Estrange's Observator*," and that by "*Lesly's Rehearsal*."

At the Restoration, the wings of political fame were clipped; the "Mercuries" disappeared; and in 1680, newspapers and pamphlets were prohibited by royal proclamation. In the time of King William, and during great part of the following reign, although the press was free to a certain extent, and though several literary journals were circulated, the only vehicle for news, was the "*London Gazette*," which was originally established by the King's party in 1642, under the name of the "*Oxford Gazette*," but was afterwards dropped, and resumed in 1665 under its present title.

During the reign of the two first sovereigns of the House of Hanover, more than half a dozen of journals, almost exclusively devoted to the communication of news, were established in London; but as yet much was wanting to complete the scheme of our present newspapers. At the late King's accession, and for many subsequent years, we find in the papers of the day—of which, the "*London Chronicle*," and the "*St. James's Chronicle*," are still in existence—neither political discussion, Parliamentary intelligence, or even reports of the proceedings of the courts of law. The debates of Parliament at that time seem to have been as unknown to the body of the people, as the deliberations of the Privy Council; the commencement and conclusion of a session were mentioned sometimes in a single paragraph; and if a member wished to inform his constituents of the particular line of conduct which he had pursued, he was obliged, like honest Andrew Marvel, to correspond with them every day by letter. Even domestic information was so scantily diffused, that one of the earliest country newspapers, established in the west of England, used to communicate the intelligence from Yorkshire and other parts of the north, under the head of *foreign news.*

It is almost needless to say to what an extent the publication of newspapers is now carried. It was lately ascertained by a return of the Stamp Office, that the number in London alone was three hundred thousand, and in the country, six hundred and fifty thousand weekly; making an aggregate of fifty millions annually. The number of different daily and weekly papers published throughout Great Britain amounts to about three hundred.

It would extend this article to too great a length, to give even the most concise account of the origin, number, and characters of foreign journals. Holland led the way in this species of publication; and scarcely a capital is now to be found without its "Gazette," or a town of any extent without its "Diary." They have flourished most where liberty is most widely diffused, and most firmly established; and, next to England, America seems to be the chosen seat of free discussion and newspaper publication. The number annually disseminated throughout the United States, amounts to twenty-five millions, which probably far exceeds the amount of those published in the whole of the French empire; but no single journal, in any country, ever attained the circulation of the Parisian "*Moniteur Universel,*" which, during some period of the late war, averaged forty thousand a day.

PRICE-CURRENTS.

EARLY IMPORTANCE OF MERCANTILE OPERATIONS;—TARIFF OF BARCELONA;—FIRST EUROPEAN PRICE-CURRENT;—INTRODUCTION INTO ENGLAND;—PRICE-CURRENT AT CALICUT.

ALTHOUGH it is certain that mercantile transactions had acquired a certain degree of importance in the fourteenth century, we possess but little information regarding the modes in which they were then conducted, and none respecting the means possessed by merchants of acquiring a knowledge of the value of commodities in distant countries; that such intelligence was regularly and generally communicated, we must, however, presume, from the accuracy with which the course of exchange is mentioned at the early epoch instanced in the article on bills of exchange. We find, also, in the Spanish work to which reference has been there made,* that, so far back as the year 1221, there existed in the custom-house at Barcelona a tariff of articles of merchandize, in which the various qualities of each were specified, and duties were rated accordingly: from which we may also conclude, that, even at that remote æra, commerce had already been reduced to a regular system. Still, as the art of printing had not been introduced at the latest periods to which we have alluded, it must be supposed that no price-current of the periodical value of goods in the principal commercial cities could have been universally circulated. Accordingly, the first of that kind of which there is any record in Europe, is dated at Amsterdam in January 1613.

From this period they gradually became general throughout the continent; but it was not until the year 1634 that they were adopted in England. They were introduced by John Day, a sworn broker of London, who obtained an exclusive privilege for printing "Weekly Bills of the Rates of Prices of all Commodities," and the patent expressly says, that such bills had been for a long time in use in foreign countries, but had not before been published in London.

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* Memorias historicas sobre la marina commercio y artes de la Antigua Ciudad de Barcelona.—Por. Dn. Anto. de Capmany, Madrid, 1799, 2 vols. 4to.

Whether this mode of communicating commercial intelligence was practised in the East-Indies at an earlier period than in Europe has not been ascertained ; but, in Ramusio's collection of voyages, the value of some articles at Calicut is mentioned in a manner that seems to indicate the existence of a regular price-current in that city in the year 1516; some of the particulars of which will be found under the head of INDIGO.

STREET PAVEMENT.

STREETS OF ANCIENT ROME;—OF POMPEII AND HERCULANEUM;—OF THE GRECIAN CITIES;—PAVEMENT OF CORDOVA;—OF PARIS;—OLD CUSTOM IN PARIS AND EDINBURGH;—FORMER STATE OF THE STREETS OF LONDON;—PAVING ACT;—WATER-CLOSETS;—STREETS OF CONTINENTAL CITIES;—SINGULAR PRACTICE AT BATAVIA.

THE public accommodations now so commonly found in every great town, are considered as so indispensably necessary, that they are generally supposed to have been coeval with the first erection of cities; yet, if we inquire into the antiquity of many of them, we shall find that some, of the most obvious utility, were not only unknown to the most splendid capitals of ancient times, but are, in fact, comparatively modern improvements.

Among the first of all public conveniences is that of a facility of locomotion; and hence we find, that the Greeks and Romans paid particular attention to the construction of their roads. But it is somewhat singular, that they were at the same time indifferent as to the state of their streets; and although one might imagine that men would be more desirous of a good pavement in front of their houses, where they daily trod, than on highways which they could seldom have occasion to use, it is nevertheless certain, that the streets of ancient Rome were only very partially paved during its most brilliant æra, and are described by authors of that period as being filled with dirt. Pompeii and Herculaneum, both provincial towns, were, indeed, not only paved, but had trottoirs for the foot passengers; but the centre pavement only allowed of the passage of one carriage at a time.

Although the most minute accounts have been transmitted of the buildings in many of the Grecian cities, yet we hear nothing of the pavement of any of them: except, indeed, that the streets of Thebes were under the inspection of certain officers, whose duty it was to keep them in repair; from which some persons have inferred that they were paved. A similar conclusion respecting Jerusalem has been drawn from a passage in the Talmud, in which it is stated that the streets were swept every day; which would seem to imply a solid pavement. But a verse in the prophecies of Ezekiel would lead to a contrary inference respecting those of the great city of Tyre, for it is there said, "*with the hoofs of his horses shall he tread down all thy streets;*"* and unless we make allowance for the latitude given to poetical expression, the words "*tread down*" cannot be considered as applicable to pavement.

The oldest pavement of which we have any account, in modern cities, is that of Cordorva, in Spain, which was paved with stones so early as the middle of the ninth century, while under the dominion of the Moors, in the thirtieth year of the reign of the Caliph Abdulrahman II.; who also caused water to be conveyed into the city in leaden pipes.

Paris was the next to adopt this improvement; but it did not take place there until the year 1184, on which occasion Rigord, the historian of Philip II., says, "that the name of the city was changed from Lutetia, by which it had been previously called on account of its filthiness, to that of Paris the son of Priam." What connection there was between the city and Priam does not appear; but he tells us that the king, standing one day at a window of his palace, and remarking that the dirt thrown up by the carts produced a most noxious stench, resolved to remedy the nuisance by causing the streets to be paved. We may, indeed, conjecture how offensive they must have previously been, from the circumstance that swine were constantly permitted to wallow in them, until a prince of the blood being killed by a fall from his horse, in consequence of a sow running between its legs, an order was issued that they should not in future be suffered in the streets. But against this, the monks of the Abbey of St. Anthony remonstrated strongly, insisting that it was a want of respect to their patron to prevent his pigs from going wherever they pleased; and it was, in consequence, found necessary to grant them the exclusive privilege of wallowing in the mire without molestation, only requiring the holy fathers to turn them out with bells about their necks.

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* Ezekiel, ch. xxvi., v. ii.

Two centuries after the first paving of Paris, a mandate was issued that every citizen should repair and clean the streets before his own house; but they were, nevertheless, filled with dirt in spite of repeated laws inflicting severe penalties. In some places the shopkeepers joined and kept a cart at their own expense for the purpose of its removal; but the nobility and clergy pleaded their privileges of exemption. To clean the market places and the squares was no one's business, and, consequently, these became the common receptacles of filth brought thither by night from all parts of the town. We may guess the state of the Parisian streets from the circumstance of the first privy being known in that city in 1513;* and from its being the custom at that time for the inhabitants to throw all offensive matter out of the windows; which they were permitted to do on giving notice by calling out, three times, *gare l'eau!* The Scotch, who probably learned this laudable practice from their ancient continental friends, carried it down to a much later period: it is not many years since the passenger in the streets of Edinburgh was sure to be greeted, after nightfall, with the awful notification of *gardy lou!* which Smollett has facetiously translated, "*the Lord have mercy upon you!*" And even at the present day, it is not quite certain that, in some parts of the *auld toune*, the same salutation might not yet be heard, with the once familiar response, "*haud yer haunde lassie.*"

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* It would appear, however, that monasteries were provided with these conveniences at a much earlier period; for, among the works of the Saxon monk, Adhelinus, who is mentioned in the article "Writing Pens," and who died in 709, there is a sonnet addressed "*ad Latrinium*" (*latrinam*).

The streets of London were not paved in the eleventh century; nor is it certain at what time this improvement was first introduced. In 1090, Cheapside was of such soft earth, that when the roof of Bow Church was blown off by a violent gale of wind, four of the beams, each twenty-six feet long, were so deeply buried in the street, that little more than four feet remained above the surface. The first toll that we know of in England, for repairing the highways, was imposed in the fourteenth century, during the reign of Edward III., for mending the road between St. Giles's and Temple-bar. It was not until 1417 that Holborn was paved, though it was often impassable from its depth of mud. Even during the reign of Henry VIII., many of the streets are represented as "very foul, and full of pits and sloughs, very perilous and noyous, as well for all the King's subjects on horseback as on foot, and with carriage;" and Smithfield was without pavement until 1614. In 1678, commissioners of sewers were appointed: but we learn from a proclamation of the Lord Mayor, in the following year, that the paving and cleansing of the city were still much neglected, and, in fact, down to 1762, the streets of the metropolis were generally obstructed with stalls, sheds, sign-posts, and projections of various kinds. Each inhabitant paved before his own door, in such manner, and with such materials, as pride, poverty, or caprice might suggest: there were no flagged trottoirs—

the footway was exposed to the carriage-road, except in some of the leading streets, where they were separated by a line of posts and chains, or by wooden paling. In that year the "Westminster Paving Act" passed, from which we may date all those improvements, which have rendered London superior in cleanliness and accommodation for passengers to any other city in Europe.

They who are only accustomed to the pure air and clean streets of London, will scarcely believe that many large cities are even yet in a great measure destitute of the convenience of water-closets. Madrid was without this improvement at a time when it was found by English navigators near the habitations of the savages of New Zealand, and most of the towns throughout Spain are still deficient in that respect. In Lisbon, the gardy-lou of Edinburgh is to this day replaced by the Portuguese "*agua vai!*" In the streets of that great city the filth is suffered to accumulate in heaps, which, in the summer months, are dried into dust and scattered by the wind, and in the winter are partially carried off by the rain; hogs and unowned dogs are the only scavengers; and, in some of the narrow lanes of the old town, the inhabitants are supposed never to have seen the pavement. It is only a few years since the streets of Warsaw ceased to be the common receptacle of every kind of dirt. Even those of the now elegant Berlin were never cleaned until about the middle of the seventeenth century; and hog-sties were at that time to be found immediately under the windows. This practice was, indeed, forbidden, but to little purpose, in 1641, and it was not until forty years afterwards that it was suppressed, by a positive order that no inhabitant should keep swine; which, as St. Anthony had no abbey in Berlin, was carried into execution without any exception.

The pavement of the cities of Holland is superior to any other, both from being entirely composed of that kind of brick which we call clinkers, and from its being but little worn by carriages. The Dutch could scarcely be otherwise than cleanly, from the abundance of water in all the streets of their large towns; but they have carried their northern ideas into latitudes but ill suited to receive them. At Batavia, situated almost under the equinoctial, they have introduced the canals of their native country: these, about nine every evening, are covered with the boats of the Chinese gardeners; and, at a well-known signal, the slaves run out with large china jars, filled with offensive matter, and empty them into these floating magazines of productive manure. An intolerable stench infects the whole atmosphere; but is so little regarded by the phlegmatic inhabitants, that it only sometimes draws forth an observation, that the nine o'clock flower is now in blossom, "*daar bloiet den foela nonas horas!*"

STREET-LAMPS.

ILLUMINATION OF ANCIENT CITIES;—ROME; JERUSALEM; CONSTANTINOPLE;—ANTIOCH;—INTRODUCTION AND PROGRESS OF THE LIGHTING OF LONDON;—AND OF PARIS;—FALOTS;—LAMPS;—STATE OF ILLUMINATION ON THE CONTINENT.

THE lighting-up of streets, at present so generally adopted in the cities of Europe, though not altogether a modern invention, was unknown to the ancient Greeks and Romans; who, when returning from their nocturnal revels, had torches, or lanterns, carried before them by their slaves. These, indeed, well supplied the place of our reverberators, to the wealthy, whose train is represented as bearing—

'The sun-bright flambeaux, and the lamps of brass."

but the same poet also vividly points the dangers to which the more humble pedestrian was exposed :—

> —— " Whom the moon, or candle's paler gleam,
> Whose wick he husbands to the last extreme,
> Guides through the gloom."
>
> *Gifford's Juvenal, Sat. iii.*

Public illuminations on particular festivals are, however, very ancient :—Egypt and Greece had them ; Rome was lighted up on the occasion of some games exhibited under Caligula ; the Jews illuminated the holy city for eight days, at the feast of the dedication of the temple ; and Constantinople was hung with festal lamps on Easter-eve.

It would appear, from some passages in the fathers of the Greek church, that Antioch was permanently lighted in the fourth century ; for, in an account there given of an altercation that took place in public between a schismatic and a true believer, it is related, " that they disputed *until the streets were lighted*, when they spat in each other's face and departed ;" and in another passage, it is mentioned, " that some riotous soldiers cu the ropes from which were suspended *the lamps that gave light to the city in the night-time.*" From similar authority we also learn, that the streets of Edessa, in Syria, were lighted in the year 505.

Of modern cities, it is difficult to determine which was the first to adopt this improvement. The citizens of London, as we are informed by Maitland, were ordered to hang out lanterns to light the streets, so early as the year 1414; and, according to Stowe, Sir Henry Barton, during his mayoralty, in 1417, "ordained lanthornes with lights to bee hanged out on the winter evenings betwixte hallontide and candlemasse." If this account be correct, it would follow, that London must have set the example in this respect to the other cities of Europe. During three centuries afterwards the citizens were occasionally reminded of this regulation, under pains and penalties for its non-observance; but the frequency of the repetition only proves how ill it was obeyed. In 1668, the inhabitants were ordered "to hang out candles duly to the accustomed hour, for the peace and safety of the city;" in 1679, we find the Lord

Mayor complaining of "the neglect of the inhabitants of the city, in not hanging and keeping out their lights at the accustomed hours, *according to the good and antient usage* and acts of council in that behalf;" in 1690, the order was renewed, with an exception in favor of those who should agree to make use of lamps of any sort, to be placed at such distances in the street as should be approved of by the justices of the peace; and in 1716, it was directed, that each house should have a lamp hung out on every night between the second after full-moon until the seventh after new-moon, from the hour of six in the evening until eleven. In 1736 and 1739, the present mode of lighting was partially adopted, "in the city and liberties thereof;" but as this did not extend to the whole town, and many street robberies were committed, an act of parliament was passed, in 1744, for completely lighting the cities of London and Westminster; and the time, which had formerly been limited to certain periods, was extended to the entire year.

Paris seems to have been first lighted in 1524; when a mandate was issued requiring the inhabitants to keep lights burning from nine in the evening, in those windows which fronted the street, in order to guard against incendiaries and robbers. This order was renewed in 1553; but, in 1558, large vases called *falots*, filled with pitch, resin, and other combustibles, were placed at each corner of every street; and, as Paris then contained 912 streets, the number of these must have been considerable. They were, however, changed, in the same year for lanterns; but of what description is not clear, as the order respecting them merely calls them "*lanternes ardentes et allumantes.*" We may, however, conjecture how imperfect this mode of lighting must have been, from the circumstance that, in 1662, an Italian Abbé, of the name of Laudati, obtained an exclusive privilege for twenty years to let out torches and lanterns for hire. For this purpose he erected booths in every part of Paris, and had men and boys in waiting at each, ready to attend either foot-passengers or carriages: to the latter, his charge was five *sous* for a quarter of an hour; to the former, three; and, to avoid disputes, each link-boy also carried an hour-glass. A few years afterwards, however, a magistrate who is celebrated for his intelligence in the arduous office of head of the police—Gabriel Nicholas de la Reynie—regulated the lighting of the city much in the present manner: the lamps are suspended over the centre of the streets from chains, which pass across from house to house, and the light is thus equally diffused over every part. The reverberating lamps are a French invention, and were introduced in Paris in 1766: the entire road to Versailles, nearly ten miles in length, was lighted with them in 1777.

With the exception of Rome, which still remains in the dark, notwithstanding an effort made by Pope Sextus V. to have the streets illuminated, all the capitals of Europe have now admitted this pleasing and truly essential improvement. In 1553, at the Hague, lights were ordered to be placed before the doors, on dark nights; and in 1678, lamps were placed in all the streets. In 1669, Amsterdam was lighted with horn-lanterns; which have, however, been since changed for glass. Hamburgh followed this example in 1675. In 1679, every third house in Berlin was to shew a light; and in 1682, it was lighted, but very indifferently, as it still is, at the public expense. Vienna was first lighted in 1687; and Copenhagen sometime previous, in the reign of Christian IV. Hanover was supplied with lamps in 1696; but Dresden, Leipsic, Cassel, Halle, Göttingen, Brunswick, and some other German towns, not until the eighteenth century. Venice, Palermo, and Messina, are all well lighted: but Naples, and many other of the Italian cities, are still very deficient in this respect. Madrid, Cadiz, Valencia, Barcelona, and, indeed, all the chief sea-port towns in Spain, are illuminated; but it is not yet quite twenty years that the populous and opulent city o Lisbon has enjoyed the same advantage. Previous to that period, a solitary lamp suspended here and there before the image of a saint, scarcely afforded a partial glimmer to guide the foot-passenger through the heaps of dirt with which the streets are encumbered, and the most appalling advantage was taken of the facilities which the gloom afforded for nightly assassination.

STREET-WATCH.

ANTIQUITY OF THE NIGHT-WATCH;—MODERN INTRODUCTION;—ANCIENT WARDERS;—STEEPLE WATCHMEN;—CUSTOM OF ANNOUNCING THE HOUR;—RATEL WACHT.

The greatest improvement in Police regutions, after those of paving, cleansing, and lighting the streets, was certainly that of guarding them by a nightly watch. It is an institution of very ancient date, and is often alluded to in the scriptures. Athens, and other cities of Greece, had centinels posted in different parts; and Rome had a patrole, who carried bells, which they used in case of an alarm of fire. But these were under military discipline, and their duties appear to have partaken of a military as well as civil nature.

In whatever shape it may have existed in the Greek and Roman cities, this institution was lost in the barbarous ages, and appears not to have been revived until a comparatively late period. The French, indeed, so early as the year 595, had a military night-watch, termed the *guet*, which they say is derived from the German *wacht*, the watch; as *bivouac* is from *bewacht*: but this would seem to be rather a duty imposed upon the citizens alternately, for their mutual protection, than a regular street-watch, although it is not improbable, that the custom of providing substitutes to perform the office, may have given rise to that establishment.

In the earliest ages men were posted on the tops of towers to watch the approach of an enemy; and, during the periods of feudal strife, when neighbouring chieftans often made sudden inroads on each other, this precaution became so necessary, that every baronial castle was provided with its warders. We learn, from an ancient Welch record, that these were, in that country, provided with horns to sound an alarm; and those in the castles of the German princes in the sixteenth century blew a horn every morning and evening, on the relieving and setting of the guard.

Watchmen of this description were also employed in the towns, where they were lodged in the steeples of the churches; and, as their vigilance was required to give the alarm in case of fire, they were retained even when the restoration of tranquillity had removed all apprehension of hostile incursion. Their office was filled by the city musician, a person of importance in those times, whose duty it also was to attend at weddings until nine o'clock at night, at which hour, as we learn from an ordinance of the Berlin police in the sixteenth century, "he was to blow his horn on the steeple, and place the night-watch." These steeple-watchmen, indeed, are mentioned in the annals of some German cities so early as the fourteenth century, and the narrow cell which they occupied is still shown in many of the ancient church-towns. Inconvenient as this apartment must ever have been, it was at first appropriated as the residence of their wives also; but a profanation of the church being apprehended by the scrupulous, this part of the regulation was abolished.

The custom of calling out the hour of the night, seems to have had its rise in the walled towns of Germany from that of publicly announcing the time of opening and shutting the gates, before the invention of clocks; but its antiquity cannot be determined. Montague mentions it in his travels, in 1580, as a singular novelty peculiar to the German cities; and Mabillon makes a similar remark so late as 1683. The watchman's rattle is undoubtedly of German origin; and from it, the street-watch is in Holland called the *ratel-wacht*.

TONTINE.

DEFINITION OF TONTINES; — ORIGIN OF THE TERM; — FIRST ADOPTION OF THE TONTINE; — SUCCESSFUL ADVENTURER; — ADAPTATION IN ENGLAND.

A TONTINE is an annuity granted to each of a certain number of subscribers to a fund, who are classed according to their respective ages, in proportion to which they receive a certain rate of interest on their subscription, with the benefit of survivorship; by means of which, those who happen to survive obtain a gradual augmentation of their income, by the division among them of the annuities of those who die; and at length, the longest liver becomes possessed, for the remainder of his life, of the whole sum at first paid to the joint nominees.

This scheme took its name from one Lawrence Tonti, a native of Naples, who, in 1644, or, as some authors say, in 1653, proposed it to the French ministry as a mode of raising money for the service of the state, from which circumstance he has generally been considered as the projector; but it had, in fact, been long previously known in Italy. The plan was rejected, and Tonti then invented the lottery, which we have already mentioned under that head, and which was adopted in France with the title of "*Blanque Royale*," and not, as some writers have erroneously asserted, of *Banque Royale*.

The Tontine was not actually brought into use until the year 1689, when Louis XIV., distressed by the league of Augsburgh, had recourse to the plans of Tonti, which, though long laid aside, were not forgotten. A royal tontine was then created of 1,400,000 livres annual rent, divided into fourteen classes: the shares were three hundred livres each, and the subscribers were to receive ten per cent. interest, with the benefit of survivorship in every class. The scheme, however, was but imperfectly executed, although the annuities were regularly paid. A few years afterwards, another tontine was proposed, and although it was more favourably received than the former, it was not more than half filled. They both subsisted in the year 1726, when the French Government united the thirteenth class of the first tontine with the fourteenth of the second, all the shares of which were then possessed by one individual, named Charlotte Bonnemay.

This lady, who was then the widow of a surgeon of Paris, and who died in her ninety-sixth year, had originally subscribed three hundred livres to each of the tontines, for which she, in the last year of her life, enjoyed an income of 73,000 livres, or about £3,000 sterling.

The system of tontines has been occasionally resorted to in this country, for procuring the sums required for erecting bridges, large hotels, and other expensive edifices; but, although it has succeeded in some instances of private speculation, it has not been found practicable on a scale of sufficient magnitude to aid the financial operations of Government.

END OF BOOK I.

BOOK II.

ON THE ADOPTION AND INTERCHANGE OF NATURAL PRODUCTIONS.

ARGOL.

PROPERTIES OF ARGOL; — WHETHER KNOWN TO THE ANCIENTS; — MODERN DISCOVERY; — ORIGIN OF THE FAMILY OF RUCELLAI; — INTRODUCTION OF THE ART OF DYEING INTO EUROPE; — DISCOVERY OF ORCHILLA WEED IN THE CANARIES AND THE CAPE DE VERD ISLANDS; — CONJECTURES RESPECTING THE ROMAN PURPLE.

ARGOL, or as it is usually termed in commerce, orchilla-weed, is a moss which is found in some of the islands of the Levant, in the Canaries, and in the Cape de Verds. Of this substance, combined with lime and with animal and alkaline salts, a dark red paste is formed, which is much used for dyeing; and from it is also produced that well known substance called *lacmus*.

The ancient naturalists gave the name of Φυκος Θαλαςςιον (*fucus thalassion*) to a plant which grew on the rocks of the Island of Crete, and which had been long used in the dyeing of wool. Pliny tells us, that the dyers employed it to give the first tint to cloth which they intended to dye purple; and although several kinds of moss produce a red colour, yet no species is yet known which imparts so brilliant a tint, or which corresponds so closely with the description of the ancient fucus thalassion, as our argol. We may, therefore, venture to conclude that it was not unknown to the Greeks and Romans, but the exact period when it was first employed in modern trade is uncertain. It has been asserted by some writers, that it was first found in the Canary Islands, and was not discovered until afterwards in the Levant; but that this opinion is erroneous will appear from the following circumstance.

Among the oldest and most eminent families in the city of Florence is that of the *Rucellai*, several of whom have distinguished themselves as statesmen and men of letters. The ancestor of this family was a German nobleman named Ferro, who lived in the beginning of the twelfth century, one of whose descendants carried on an extensive trade in the Levant, by which he amassed considerable wealth, and on his return to Florence, about the year 1300, made known the art of dyeing with Argol. It is said, that he discovered its properties by an accidental circumstance; and that when he had brought the art of dyeing wool with it to perfection, and had long employed it for his own advantage, he at length imparted the secret to the state; in remembrance of which service his posterity were called *Oricellarii*, from the art being termed dyeing in *oricello*, and the name in process of time was changed into Rucellarii, and lastly into *Rucellai*. Bayle mentions many distinguished members of this family in his dictionary, under the names of Oricellarius and Rucellai, and shews that they all belonged to the same stock; but he seems to have been ignorant of the origin of the appellation.

As many documents still preserved among the Florentine archives confirm the account of the origin of this family name from the discovery of the secret of dyeing in oricello, it may be presumed that the Europeans were first made acquainted with the value of this dye stuff in the beginning of the fourteenth century. About that period the Italians brought from the east the seeds of many arts and sciences, which, afterwards sown in Europe, and nurtured with increasing industry and skill, produced the richest harvests to posterity, and among these, the various branches of dyeing bore a prominent share; for which reason, although there can be no doubt that the Florentine taught the art in question to his countrymen, it is probable that he also learned it in the Levant, where it was, no doubt, known for ages, and that he is not entitled to the merit of the original discovery.

The Canary Islands, after being long lost or forgotten, were again discovered about the close of the fourteenth or the beginning of the fifteenth century. One of the first settlers there was John de Betancourt, a gentleman from Normandy, who landed in Lancerotta in 1400, or, as some say, in 1417. Among the productions of the place, it is particularly mentioned, that he found orchella weed in greater abundance, and of better quality, *than any where else;* and this circumstance alone establishes the fact that it could not then have been a new discovery.

This moss was afterwards discovered on the Cape de Verd Islands by the captain of an English vessel, in the year 1730, and the greater part of that consumed in our manufactures is now imported from thence. It is larger, longer, and richer than that of the Canaries, which is perhaps occasioned by its not being gathered every year. It was also discovered by Adanson, in 1749, on the rocks in Magdalen Island near Senegal; and it is collected on some parts of the coast of Barbary, and in the Island of Elba. From the circumstance of its being found in the islands and on the coast of Africa, Glass has supposed, in his history of the Canary Islands, that the Getulian purple of the ancients was dyed with it; but this opinion is improbable, for Horace praises the

> "——Vestes Getulœ *murice* tinctas."
>
> *Epist. lib. ii. ep.* 2.

CANARY-BIRDS.

NATIVE COUNTRY;—EFFECTS OF SUGAR ON SOME BIRDS;—INTRODUCTION OF THE CANARY INTO EUROPE;—REARING AND EXPORTATION;—FOOD;—CANARY-SEED.

THIS beautiful little bird, which is reared in our climate with such anxious care, and is so much admired both for the delicacy of its plumage and the sweetness of its note, is a native of the islands from which it derives its name. It was not known in Europe until towards the latter end of the sixteenth century, and was first described by Aldrovandi, in 1610, when it was so scarce and costly, that it could only be procured by people of fortune. It was, at first, called the sugar-bird, because it was said to feed upon the sugar-cane; and it certainly pecks with eagerness at the lumps of sugar which its fair mistress usually places between the wiry bars of its splendid prison. This circumstance has been considered extraordinary, as experiments have shewn that, to some of the feathered tribe, that salt is a poison. A pigeon, to which four drachms of sugar were given, died within four hours; and a duck, which had also swallowed five drachms, only survived seven hours: from which it would appear that the power of poisons is only relative.

The circumstance of canary-birds being said to be fond of the sugar-cane, would naturally lead to the supposition that they are to be found in the West-India Islands: but this is not the fact; and it is, on the contrary, a common speculation among the sailors on board our Falmouth packets to carry them out there for sale.

The canary was first bred in Europe about the beginning of the seventeenth century. The practicability of this was ascertained by accident: a vessel bound for Leghorn, on board of which were a number of these birds, was wrecked on the coast of Elba; where, being thus set at liberty, they soon multiplied, and would no doubt have become naturalized in that favourable climate, had not the price which they commanded induced the inhabitants to lay snares for them, and to pursue them with such eagerness, that the original breed was soon lost to the island. Olina, an ornithologist of that period, says, indeed, that the breed degenerated; but this was, probably, occasioned by their pairing with other birds of the island, and thus producing that spurious kind which we denominate mules.

Such was the value attached to these little songsters, that the Spaniards endeavoured to secure a monopoly in the trade of supplying Europe with them; and with that view enacted several regulations respecting their exportation from the Canary Islands. These, at that period, had the desired effect, and for a long time impeded their propagation in any other place; but, at present, they are bred, both for profit and amusement, in this country and in many other parts of Europe. This kind of industry is, however, more common in Germany, and particularly throughout the

Tyrol, than elsewhere. At Imst, near Insbruck, there is a company of bird-men, who, when the season is over, send agents throughout the country, who purchase the young canaries from the breeders, and they are afterwards sent for sale, not only to every other part of Germany, but to Russia, and even to Constantinople. About sixteen hundred are imported into this country every year; and it is truly surprising that the dealers, notwithstanding the original cost and the expenses of so long a journey, should yet afford to sell them at often so low a price as five shillings each. Many of them, however, as well as the bullfinch, are taught to sing particular tunes; and although these, to the admirer of nature, can never replace the melody of the wild notes, yet their novelty occasions them to be sometimes sold for considerable sums.

The chief food of this bird is a seed which is also indigenous in the Canary Islands, and with us takes its name from that circumstance. In modern times it certainly was brought from thence to Spain, whence it was dispersed over the rest of Europe; but the plant is supposed to be the same that was known to the ancients by the name of *Phalaris*, and it is distinguished by botanists as the *Phalaris Canariensis:* in this country, it is chiefly cultivated in the Isle of Thanet. It is a genus of the class *triandria*, of which there are eleven species, but three only are common in this climate.

CARP.

ANCIENT NATURALISTS;—CYPRINUS;—EPICURISM;—ABSTINENCE OF THE GREEK AND EGYPTIAN MONKS;—EARLIEST ACCOUNTS OF CARP;—DERIVATION OF THE NAME;—INTRODUCTION INTO EUROPE;—INTO ENGLAND.

THE question, whether our carp were known to the ancients? is one that cannot easily be resolved. The knowledge possessed by their naturalists was either very circumscribed, or they have been at little pains to display it; and ichthyology is, besides, attended with far greater difficulties than the history of quadrupedes; the conformation of the various species of the latter being not only more distinct, but more constantly exposed to observation, they are more easily classed and described: they may alarm us by their ferocity, or elude us by their caution, yet is it still possible to notice their age, sex, and habits, with many minute particulars that distinguish the different genera; while fish exist in an element which in a great measure conceals them from remark. The chase has, also, ever been the amusement of the wealthy and the idle, and the objects of pursuit attracted attention in proportion to the sport they afforded; while fishing, if we except the occasional diversion of angling, has always been the laborious occupation of the indigent, who had neither leisure nor knowledge sufficient to communicate their observations. It is not, therefore, to be wondered at that the brief accounts of fish to be found in the writings of ancient authors afford but little satisfactory information.

Were we to be contented with the testimony of commentators who have investigated the subject but slightly, we should at once admit that the *Cyprinus* of the ancients could be no other than our carp: but the grounds for that supposition are far from being conclusive, and are chiefly founded on what is said of the fleshy palate and large scales with which it is described, the former of which apply equally to the bream and tench, and the latter to every species of the mullet; and it is, besides, enumerated by Oppian and Pliny among the sea-fish.* What is still more extraordinary, if it really was known to the ancients, is, that when they mention the palate or tongue, they say nothing of its being esteemed a delicacy, though every modern *gourmand* is aware that it is the only part of the fish worth eating; and certainly the epicures of Rome and Athens yielded in no point of culinary science to those of either London or Paris. This is the more singular, because fish was in far greater esteem among them than any other kind of food, and is much oftener mentioned in their books of cookery and accounts of great entertainments than dishes composed from other animals. Indeed, so generally was it viewed as a luxury, that when the Egyptian and Greek Monks wished to acquire a reputation for superior sanctity by more than ordinary temperance, they abstained from fish as the greatest of all dainties. On the other hand, it is said that carp are still called *Cyprini* in some parts of Greece; and, as it is an undoubted fact that most of the ancient names have been retained in the modern language of that country, this, if substantiated, would be decisive of the doubt.

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* *Oppian. Halieut.* lib. i. 101 and 592. *Plin. Hist. Nat.*, lib. ix. cap. 16.

The earliest certain account of Carp occurs in the writings of Cassiodorus, who lived in the sixth century, and speaks of it as a most delicate and costly fish, which was found in the waters of the Danube. In the thirteenth century it is incidentally mentioned in the works of the monk Cæsarius, who says, that, "the devil appeared to brother Simon, habited in complete armour, having scales like the fish called *carpo*."* About the same period another author describes all the habits of the *carpera*—its cunning in avoiding rakes and nets, sometimes thrusting its head into the mud in order to escape underneath them, at other times joining the head and tail together, and then, with a bound, suddenly springing over them; and its caution in refusing bait: all which are qualities known to belong to our carp. The derivation of the modern name has not been satisfactorily ascertained; as usual, it has been exposed to all the metamorphoses of etymology, the least inconsistent of which is the deduction of Menage, who traces it from *Cyprinus*, which he supposes to have been afterwards changed into *Cuprinus*, *Cuprius*, *Cupra*, *Curpa*, and finally into *Carpa*, *Carp*.

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* *Post hæc frater Simon vidit dæmonem loricatum et galeatum, habentem squamas, tanquam piscis qui vocatur carpo.'* — Cæsarius, Dialog. Miraculorum, distinct. xi., cap. 29.

It appears certain that this fish was first brought to this part of Europe from the south. It was not known in France in the thirteenth century, although at present it is common throughout that country; and it was carried from Italy, in the sixteenth century, into Prussia, where it is held in great esteem, and is bred to a very large size, in ponds, particularly in the neighbourhood of Dantzick and Königsberg, where it has been known to exceed thirty pounds in weight. It is supposed to have been first introduced into England about the year 1514, by Leonard Mascal, of Plumsted, in Sussex; some account of whom may be found in "Fuller's

English Worthies." In the Linnæan system it is said not to have reached this country until about the year 1600; but that certainly is an error. Baker fixes the period, in his Chronicles, in 1524, about the fifteenth year of Henry VIII., when, according to the well-known distich,

> " Turkies, *Carps*, Hoppes, Piccarell, and Beere,
> " Came into Englande all in one yeare."

COCHINEAL.

DESCRIPTION OF COCHINEAL;—KERMES;—SCARLET DYE;—ORIGIN OF THE TERMS CRIMSON AND VERMILLION;—HÔTEL DES GOBELINS;—INVENTION OF THE MODERN MODE OF DYEING SCARLET;—FIRST SCARLET DYE-HOUSE IN ENGLAND;—PRODUCTION OF COCHINEAL IN MEXICO;—NOPALERA;—ANECDOTE OF LINNÆUS.

Cochineal is composed of small grains of a shrivelled appearance and reddish brown colour, often covered with a silvery grey dust; when chewed, they have an astringently bitter taste, and impart a red tinge to the saliva: they are employed in medicine, but their chief use is for the purposes of dyeing.

It was for a long time generally supposed, and is still by some persons, that cochineal is the seed of a plant, and that it is only produced in Spanish America; both which opinions are erroneous. The idea of its being a vegetative seed was once so prevalent, that the scarlet cloth termed grain-dyed thence obtained its denomination, and it probably arose from the circumstance of its being gathered from the leaves of a shrub; but it is certain that it belongs to the animal, and not to the vegetable, kingdom, and in some degree resembles the insect commonly known in this country under the name of lady-bird, from the zoological name of which class, *Coccinella*, it acquired its name: its being now chiefly, if not entirely, imported from Mexico, led to the error of ascribing its production solely to that country.

Cochineal is found in various parts of Europe and of Asia, as well as of America; and the insects of which it is formed are divided by naturalists into no less than forty-six distinct species, each nourished by different shrubs and plants. Of those, our limits will only permit us to notice two—that generally known, and distinctively termed cochineal, which is the produce of Mexico; and that usually denominated kermes.

The latter is indigenous in many parts of France, Spain, Greece, and the Levant. The colouring matter is procured from the female, which is found adhering to the branches of a kind of oak called *Ilex*, or the *Quercus Coccifera*, under the form of smooth reddish grains of the size of small peas. Though less brilliant than the cochineal of America, the dye is said to be more durable, and from it was produced that deep blood-red colour so often exhibited in old tapestry. That this species was known to the ancients, admits not of doubt, for we find it mentioned, though sometimes obscurely, in many of the oldest Hebrew, Greek, and Latin authors; and it is supposed, that from it was produced the tint called *tola*, or the worm-dye, enumerated by Moses—the most ancient of the scriptural writers—among the articles required for the use of the Tabernacle, and which the translators of the Bible have rendered by the word *scarlet*. Kermes, or *alkermes*, is indeed a word of Arabic origin, and was introduced on the invasion of Italy by the Caliphs, whence it was adopted throughout the rest of Europe, and is the root of the Italian *chermesino* or *cremisino*, of the French *cramoisi*, and of the English *crimson;* but the dye itself was unquestionably known to the Phœnicians and the Egyptians, long prior to the æra of the Arabians in the East, and is conjectured to have been discovered by the former in Palestine.

Notwithstanding the early knowledge thus acquired, in the East, of the art of employing this substance to dye a brilliant red, and although the insect was known to the Greeks and Romans, it is yet remarkable that they were unacquainted with its value, and did not, in fact, possess that colour which we denominate scarlet. It is true that we find the term made use of by commentators on their writers, but it is employed synonimously with purple: the red produced by their dyers was, indeed, only a dull shade of that colour, and was obtained from the shell-fish called *murex*, or perhaps from madder; and even at a much later period, the kermes was only used, in Europe, to form a ground for purple. The epoch at which it was first employed there to dye red, must, however, have been very remote, as the deep tint to which we have already alluded is found in tapestry of the eleventh century; and in the year 1050 there is a grant of the Emperor Henry III. to the Count of Cleves, of the Burgh-Graveat of Nimeguen, on condition of his delivering to him yearly three pieces of scarlet-cloth, made of English wool. During the middle ages it acquired the name of *vermiculata*, whence was derived the term *vermilion*, now so generally used to signify any bright red, but more particularly that produced by cinnabar: the origin of *scarlata*, from which we take our word scarlet, has not been satisfactorily ascertained.

Early in the sixteenth century, in the time of Francis I., one Giles Gobelin, a French dyer, discovered an improvement on the common red then in use, and having remarked some qualities, which he thought advantageous to his art, in the water of a rivulet which ran through the suburbs of St. Marcel, at Paris, he there erected a large dye-house; which was considered so absurd an undertaking, that it obtained the name of Gobelin's folly. The tint which he produced was, however, so superior to any that had been already seen, that the Parisian scarlet soon rose into high repute, and the populace then said, that Gobelin had acquired his knowledge from the devil. The same business was there carried on by the family until the year 1667, when it was purchased by the Crown, during the administration of Colbert, and converted into a royal manufactory of tapestry, which still subsists, under the title of *Hôtel Royal des Gobelins.*

Whatever may have been the merit of the Gobelin dye, the present mode of preparing scarlet is said to have been discovered about the beginning of the seventeenth century, by a Dutchman, named Cornelius Drebbel, who died in London in the year 1634. The invention is one of the most important improvements in the modern art of dyeing, and occurred in the following manner. Drebbel had placed in his window an extract of cochineal, with which he intended to fill the tube of a thermometer. By some accident, a phial, containing aqua-regia, which stood above it, was broken, and part of the contents having dropped into the extract, converted the purple hue which it bore into a most brilliant red. After some conjecture and several experiments, it was ascertained that some of the tin by which the glass of the casement was divided had been dissolved by the aqua-regia, and was the real cause of the change. This discovery he communicated to his son-in-law, one Kuffelar, a dyer of Leyden, who afterwards employed a solution of tin, with great success; and, retaining the receipt in his own possession, it obtained the name of *Kuffelar's Dye*. In the course of time, however, the secret became known to a German, who imparted it to the brothers Gobelins, and thus it is generally supposed that they obtained their greatest celebrity.

The first dye-house for scarlet, in England, was established in 1643, by a German named Kepler, at the village of Bow, near London, whence it obtained the name of the *Bow-dye;* and, in the year 1667, one Brewer, a Fleming, who was invited to this country by King Charles II., is supposed to have brought the art here to great perfection.

Since the discovery of America, the use of the kermes has been nearly superseded by the Mexican cochineal; some account of the production of which may therefore be acceptable.

The plant on which the insects are bred

is called, in the West Indies, nopal, or *nopalera*, and is a species of the fig-tree. After the stem has risen a little above the ground, it divides into several branches, and the trunk itself, as well as these several ramifications, are full of knots, each of which sends forth a leaf, from the end of which springs another, and so on till the shrub attains to its full growth. Those leaves which are nearest to the branches are the largest; they are all rather convex, full of little protuberances, and covered with a thin and delicate membrane which always preserves a lively green hue: its flower is small, and resembles a flesh-coloured ball, in the centre of which appears the fig.

The insects, or Cochinillas, as they are there called, live upon the leaves of the nopal, the juice of which they suck; and it is remarkable, that they neither gnaw the substance of the leaf, nor does it suffer the least perceptible injury by their feeding. When arrived at their full growth, they are gathered into earthen pots, close stopped, and are soon after killed, in order to be prepared for sale. There are three different modes of performing this operation: by hot water; by fire; and by exposition to the heat of the sun. From these different methods there arises a great variety in the colour and consequent value of the cochineal; but whichever be adopted, there is a certain degree of heat, which must be carefully observed. The chief point, however, is to ascertain the exact period of the insect's having attained its utmost degree of perfection; a knowledge which is only to be acquired by experience, and is possessed by few except the Indians.

The Cochinillas may be compared in many respects with the silk-worm, and especially in the manner of laying their eggs. Such of them as are destined to breed, are taken from the leaves of the nopal when they are in full vigour, and put into baskets well closed and lined with several folds of linen, in which they lay their eggs, and soon after die. About May or June, when the nopalera is in its prime, the baskets are opened, and the young insects, which then appear about the size of mites, may be just perceived to move. In this state they are scattered upon the leaves of the plant, and no further care is required until they reach maturity, except to keep off birds and reptiles, which destroy them, and, in case of unusual cold, to warm them with smoke.

The chief Mexican provinces in which cochineal is produced, are those of Guaxaca, Flascala, Chulula, New Galicia, and Chiapa; but it is also found in the territory of Hambato and Loja, in Peru. But although the Cochinillas abound in all these districts, it is chiefly in that of Guaxaca that the Indians make it their business to propagate them, and to attend to the cultivation of the nopalera: in all the others the plant is wild, and the insects breed of themselves, and although the species of each is equal to those of Guaxaca, yet the produce, from want of the necessary care, is far inferior.

Various attempts have been made to introduce this little animal into the West India Islands, but they have been unattended with success. A spurious kind was once brought to this country from Jamaica, but died in the course of a few months. Linnæus, the celebrated botanist, also conceived the idea of propagating it in Europe; and, after many fruitless efforts, he at length succeeded in obtaining, through the medium of one of his pupils who was in Mexico, a nopal covered with Cochinillas. The plant arrived at Upsal, at a moment when he was busily engaged; but his gardener immediately planted it, and cleaned it so effectually of what he imagined to be vermin, that when Linnæus hastened to view this rare acquisition, he did not find a single insect alive.

CORK.

SUBSTANCE, PREPARATION, AND QUALITIES OF CORK;—CORK-TREE;—EMPLOYMENT OF CORK AMONG THE ANCIENTS;—MODE OF PRESERVING LIQUORS;—STOPPLES;—SPANISH BLACK;—EGYPTIAN COFFINS—MEDICINAL PROPERTIES OF CORK.

Cork is the bark of a tree of the oak species, which is found wild in the south of Europe. The tree is generally sufficiently mature to be barked at about fifteen years old, and the operation may be repeated every eighth or ninth year, the quality of the cork continuing each time to improve as the age of the tree increases. It is cut from the stem in large pieces, and is usually singed in the flame of a strong fire, or soaked for a considerable time in water; after which it is placed under heavy weights, in order to render it straight. Its extreme lightness, the ease with which it may be compressed, and its elasticity when that compression is removed, by which it closely fills any space into which it is driven by force, are properties so peculiar to this substance, that no efficient substitute for it has yet been discovered, although different kinds of spongy vegetable productions have been employed for that purpose, and particularly the wood of a South American tree, there called *moubin*, and by botanists *spondias lutea*. It also possesses the valuable faculty of resisting the admission of liquids in a superior degree to wood: it suffers neither water nor any of the common fluids to pass through it; and it is only very slowly that it is penetrated even by spirits.

The cork-tree was certainly known to the Greeks and Romans. By the former it was called φελλος *(Phellos)*, and by the latter *suber*. Some doubt has, indeed, been created respecting the former appellation, in consequence of its being applied by Theophrastus to a tree which he, in one passage, represents as being deciduous, and in another as an evergreen; but in every other respect the description given by him is that of the cork-tree; and it has, besides, been ascertained, that there is a species, chiefly found in the Pyrenees, and beyond the Alps, which drops its leaves annually.

The ancients employed cork for most of the purposes for which it is used at present: fishermen made floats for their nets, and sailors buoys for their anchors, with it; it was worn in the soles of shoes; and sometimes also as an assistance in swimming; for we learn, from Plutarch, that the Roman soldier who was sent by Camillus to the capitol, when it was besieged by the Gauls, under Brennus, wore a light dress with cork underneath, as it was necessary, in order to avoid the enemy, that he should swim through the Tiber. Nor was the mode of employing it as stopples for vessels wholly unknown to them, and various instances of its being used for that purpose may be found in the classic authors; thus Horace:—

"Hic dies, anno redeunte, festus
CORTICEM adstrictum pice dimovebit
Amphoræ fumum bibere institutæ
Consule Tullo."

Lib. iii. Carm. 8.

> "And when the year
> Revolving bids this festal morn appear,
> We'll pierce a cask with mellow juice replete,
> Mellow'd with smoke since Tellus ruled the state."
>
> *Francis.*

And Columella gives directions for preserving the must of new wine in jars stopped with cork.

Among the ancients, however, liquors were generally preserved in large urns, which were usually stopped with cement; and as the small glass-bottles now used for that purpose were not then known, cork was seldom employed. The Greeks, indeed, had a small wine-vessel covered with basket-work, which they termed φλασκειον (*phlaskeion*), from which our word *flask* was no doubt originally derived; but this was probably of earthen-ware, and was chiefly used for its security by persons on hunting parties, or on journies.

Stopples of cork do not appear to have been introduced, in modern times, until long after the invention of glass-bottles; and of that there is no certain account. The words *Boutiaux* and *Boutilles* occur, indeed, in the French language, for the first time, in the fifteenth century; but these signified nothing more than vessels of clay or metal, and more especially of leather, which latter are still in use in the south of Europe, where they may be frequently seen suspended from the saddle of the traveller. In the shops of the apothecaries in Germany, stopples of cork were not used until the close of the seventeenth century, previous to which they were made of wax. Of the immense consumption of them throughout Europe at present, some idea may be formed from the facts, that 2,208,000 cut corks were employed in 1781 at the springs of Niederselters alone in bottling the Chalybeate commonly known as Seltzer-water; and that about forty millions are annually required for the foreign wine, only, consumed in Great Britain.

Cork is, however, employed for various other purposes than that of merely closing vessels. The Spaniards burn it in order to make that colour termed by painters Spanish black; they also employ it as a lining to stone walls, by which means their tendency to retain the damp in moist weather is corrected, and the houses thus prepared are rendered warmer. The Egyptians are said to have made coffins of cork, which being spread on the inside with a resinous substance, preserved dead bodies from decay. In medicine, the bark, as well as the acorn, of the cork-tree are reputed to possess astringent qualities, when burned, reduced to powder, and used externally; and the habitual use of drinking vessels made of cork has been supposed to prove beneficial to hectic persons.

FLOWER-GARDENS.

GARDENS OF THE ROMANS;—DIFFUSION OF FLOWERS IN EUROPE;—CROWN IMPERIAL;—PERSIAN LILY;—TUBEROSE;—BELLA-DONNA LILY;—GUERNSEY LILY;—MARYGOLDS; RANUNCULUS;—STATE OF GARDENING IN ENGLAND IN THE TIME OF CHARLES I.;—JOHN TRADESCANT;—KEW GARDEN;—ORNAMENTAL GARDENING;—BROWN, REPTON, AND KENT;—CONSERVATORIES.

No decisive testimony can be adduced that either the Greeks or Romans indulged a taste for flowers: none at least that would imply their having had gardens set apart for their cultivation. "Their style of ornamental gardening," it has been observed by a recent writer, when speaking of the latter, "was formal and heavy; more calculated to procure shade than to create scenery, and better adapted to the enjoyment of exercise than of prospect. Gloomy walks, bounded by high clipped hedges, overshadowed with evergreens, and encumbered with statues, were the prevailing taste; and it has not yet been entirely exploded from the gardens of modern Italy. It is also worthy of remark, that the laurel, with which we are wont to crown the heroes of antiquity, is supposed not to have had a place in the gardens of the ancients.* Neither does it appear that they ever attempted to improve their own wild and indigenous plants, or that they imported others from foreign countries. The florid description of the gardens of Alcinous can only be considered as the effusion of poetry; and those of Cicero and Pliny were only meadows planted with cypress, and interspersed with vineyards, alcoves, and grottos. It is not, in fact, more than two centuries ago that our own gardens were probably, in point of taste, as well as of products, even inferior to those of the Romans: and for most of the embellishments we now possess, of flower-beds, shrubberies, and conservatories, we are indebted to other nations.

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* See "Sketches of the Domestic Manners and Institutions of the Romans." 12mo. London, 1821. p. 85.

The people among whom a taste for flowers was, in modern times, first discovered to prevail, were the Chinese, the Persians, and the Turks. The vegetable treasures of the Eastern world were assembled at Constantinople, whence they passed into Italy, Germany, and Holland; and from the latter into England: and since botany has assumed the character of a science, we have laid the whole world under contribution for trees, and shrubs, and flowers, which we have not only made our own, but have frequently improved in vigour and in beauty, while many of our native indigenous plants have also, by care and cultivation, been rendered worthy of a place in our parterres.

The introduction of this taste into Europe may be dated from about the middle of the sixteenth century. The researches of the celebrated botanist Clusius contributed much to excite it, and it was sustained by the continued importations of new plants, made by various travellers whom curiosity attracted about that time to both the Indies. The same period also produced some skilful gardeners on the continent; and a considerable trade then first began to be carried on in the seeds and bulbous roots of flowers. A detailed history of these, and of the various exotics that bloom in modern conservatories, does not fall within the scope of this brief notice; but some account of the introduction of a few of those best known in our parterres, may not prove wholly uninteresting.

The roots of the *Crown-imperial* appear to have been brought, about the period we have mentioned, from Persia to Constantinople, whence it was carried to the Emperor's garden at Vienna, and was from thence dispersed over Europe: it was at first known by its Persian appellation, *Tusac.*

The *Persian lily,* which is nearly allied to it, was received, about the same time, from Susa; whence it was formerly called *Lilium Susianum.*

The *Tuberose* was brought from the East-Indies, in some parts of which it grows wild, about the year 1590, by Simon de Tovar, a Spanish physician. The full tuberoses were first procured from seed at Leyden; but the propagation of the plant in so northern a climate is attended with difficulty, and, at present, Genoa supplies the greater part of both Holland, Germany, and England with the roots.

To the same person we are indebted for that beautiful ornament of our gardens, the *bella-donna lily*—the *Amaryllis formosissima of Linnæus,*—the flower of which, composed of six petals, is of a deep red, and, when the sun shines upon it, bears a lustre resembling burnished gold. He procured it, in 1593, from a vessel which had arrived at Seville from South America; of which country it certainly is a native, although it has been incorrectly ascribed to both the East-Indies and the Levant.

Another species of this genus, not less brilliant than the former, is the *Guernsey-lily*, which owes its introduction, and its present name, to the following circumstance. A ship, returning from Japan, was wrecked on the coast of Guernsey, towards the year 1630, and some of the bulbs of this plant being on board, were thus cast on shore. There they took root in the sandy soil, and soon produced beautiful flowers, which attracted the attention of Mr. Hatton, the second son of Lord Hatton, then governor of the island, who distributed them among his friends in this country and in France.

African and French *marygolds* are generally supposed to have been brought from Africa about the time when the Emperor Charles V. carried his arms against Tunis: but this is improbable; for these plants are indigenous in Peru, and were previously known to botanists under the name of *caryophillus indicus*, from which the French have given them the appellation of *œillets d'Inde*.

Of the numerous genera of the *ranunculus* the varieties are infinite, and are continually multiplied by cultivation; for those with half-full flowers bear seed which produces plants that afterwards divide themselves into other kinds and display new beauties: it is therefore difficult to speak with certainty of the parent stock. The chief of those we possess were obtained from the Levant, and it is even supposed that some species were procured from thence so early as the time of the Crusades: but that variety which is the most esteemed—the *Persian ranunculus*—was not introduced until the close of the seventeenth century, when the Grand Vizier Cara Mustapha, so well known by the siege of Vienna in 1683, obtained it from the Pachas of the East, for the amusement of the Sultan Mahomet IV. From the Seraglio it found its way, through the Christian Ambassadors, to the other Courts of Europe, and it was, in particular, long cultivated at Marseilles as an article of trade.

In the reign of Charles the First, England acquired many rare exotics through the persevering zeal and enterprize of John Tradescant, who was for some time gardener to that monarch. This person travelled through various parts of Europe, Asia, and America, from each of which he culled whatever specimens were most capable of being preserved in the climate of a country where hot-houses were then unknown; and on the fall of the regal government, he established a botanical garden at South Lambeth, which is said to have contained a very extensive collection of foreign trees, plants, and flowers. It seems to have been peculiarly rich in those of the Levant, and of the New World; and the merit and assiduity of the collector must have been unusually great, for in those days the Eastern travellers laboured under difficulties which have since been in great part removed, and North America was then only newly settled.

The impulse given to botanical pursuits during the last century, by the writings of Linnæus and others, has occasioned an interchange of plants between the most distant regions of the globe; and this country alone has, within that period, enriched its former collection with an addition of upwards of thirteen thousand new species. Of these, the greater part were acquired during the late reign, through the munificent establishment of the garden at Kew, aided by the scientific research and the liberal patronage of the late Sir Joseph Banks; and it is certain that no other nation can boast that assemblage of shrubs and flowers now to be found in Great Britain.

The passion for flowers preceded that of ornamental gardening, which continued for a long time to be totally devoid of taste.

The Dutch system of high-clipped hedges of yew or holly enclosing straight walks and formal canals, every where prevailed; and tulips and hyacinths bloomed beneath the sheltered windings of the "walls of Troy," most ingeniously traced in box. Notwithstanding all the ridicule that has been directed against Brown and Repton, we are certainly indebted to them, in no small degree, for expelling this stiff formality of style, and enlarging our prospects, by the exchange of walls and trimmed hedges for the sunk-fence. But the person who succeeded best in bringing us back to the point nearest to nature was Kent. It was he who, as Walpole observed, chastened or polished, not transformed, the living landscape: "where the united plumage of an ancient wood extended wide its undulating canopy, and stood venerable in darkness, Kent thinned the foremost ranks, and left but so many detached and scattered trees as softened the approach of gloom, and blended the chequered light with the thus lengthened shadows of the remaining columns." From his time, the taste in pleasure grounds, shrubberies, and ornamental gardening has gradually improved, and may now be said to have reached a degree of excellence in this island unrivalled in any other part of the world.

Our botanical riches are, however, in a great measure due to the valuable acquisition of the conservatory, which was introduced from Holland in the reign of William III. That elegant appendage to the modern garden was, notwithstanding, for a long time confined to the mansions of the great: it was even considered a mark of royal magnificence to have orange trees in splendid buildings; of which that at Kensington Palace, erected about that period, is a proof. The celebrated orangerie at Margam House, in Glamorganshire, was built expressly for the reception of a collection which was sent from abroad, but was wrecked in the Bristol Channel: it is one hundred and twenty-nine yards in length by twenty-seven in breadth, and is supposed to be the largest green-house in the kingdom.

HOPS AND BEER.

DESCRIPTION AND PROPERTIES OF HOPS;—ANTIQUITY OF THE CULTIVATED PLANT;—EARLIEST USE;—INTRODUCTION INTO ENGLAND;—ANCIENT MODES OF BREWING MALT;—ALE;—THE PEG-TANKARD;—PORTER;—ADULTERATION;—FOREIGN BEER;—BOHEMIAN METHOD OF PRESERVING HOPS.

It has long been matter of doubt among botanists whether the Greeks and Romans were acquainted with hops: for although they are found wild in most parts of Europe, it does not follow that they attracted attention; and many plants which were for ages considered as weeds, are now cultivated among the most valued productions of our gardens and our fields.

Hops are at present so common, that a minute description of them would be superfluous; but it may not be generally known, that it is the female plants alone which are serviceable to the brewer. These produce their flowers in cones not unlike those of the fir in form, while the male bears clusters, somewhat resembling the blossoms of a currant bush. They are propagated by seed buds, are of a rough and somewhat clammy feel, with an aromatic bitter flavor, and are added to beer, not only to render it more palatable by correcting the insipid sweetness of the malt, but also to preserve it; and of all the various substances that have been tried, none has so effectually answered both these purposes.

Some plants are mentioned in ancient authors which certainly seem to bear a strong affinity to hops; but on closer examination the resemblance ceases, and the latin terms *humulus* and *lupulus*, by which they are distinguished, are not of any great antiquity. The former is the oldest, and was probably adopted by the nation that first applied this improvement to beer; from it are derived the *humle* and *humble* of the Danes and Swedes, and the *houblon* of the French. The latter first occurs in a latin translation of the works of the Arabian physician Mesue, who wrote about the middle of the ninth century, and is applied to a plant which accords in many respects with our hops; but the date of that translation is not known, and the term is not made use of by other writers of the same age. The English word "hop" is derived from the German *hoppe*, and of this the earliest mention is found in an old dictionary of the tenth century; but of its origin there is no trace.

The most ancient known account of the cultivation of hops has been discovered in France. Among the records of that kingdom there is a patent of donation, so far back as the reign of King Pepin, in which mention is made of *humolariæ*, which doubtless meant hop-gardens; and in 822, we find that the Abbot of Corbey exonerated the millers within his district from all service regarding hops, on which occasion he employed the term *humlo*. From about that period the culture of this plant spread over Germany, and was even introduced into Sweden; but it is remarkable, that so late as the thirteenth century, it was yet unknown in Italy;

which we may presume could scarcely have been the case had it been in use among the Romans.

The first positive mention of the use of hops occurs in the beginning of the fourteenth century, when it appears that they began to be regularly employed in the breweries of the Netherlands. But, although their efficacy was admitted in the conservation of the beer, yet they were long supposed to contain qualities noxious to the constitution, among which it was said that they dried up the body and increased melancholy; and, accordingly, we find in the household regulations of our Harry the Eighth, an order to the brewer *not to put any hops into the ale.* Indeed, at a much later period, the Common Council of the City of London petitioned Parliament against the use of hops, "in regard that they would spoil the taste of the drink, and endanger the people." They were not brought into cultivation in this country until about the year 1524; and, according to a distich already quoted * from

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* Article *Carp.*

Baker's Chronicles, it would seem as if the introduction of beer should be attributed to the same period:—

> "Turkies, Carps, *Hoppes*, Piccarell, and *Beere*,
> Came into Englande all in one yeare."

But this must be understood of beer such as that still in use, for ale brewed from malt, without the addition of hops, was certainly in use here at a much earlier date, and at that time the herb called ground-ivy was generally used for preserving the liquor.

Our information respecting the ancient modes of brewing, or, indeed, of the substances from which beer was procured, is, however, extremely defective. That the Germans were acquainted with a beverage of this kind in the earliest ages, we learn from Tacitus: Columella says, that the Egyptians made use of the bitter seeds of the lupine to flavor a liquor termed *Zythum*, which has been usually considered as a species of beer; and Pliny speaks of an intoxicating liquid obtained by fermenting grain in water. The process of making malt was certainly understood by the Romans, and is clearly described by Isidorus, in the beginning of the seventh century, though he speaks of it as being applied to wheat, and not to barley; and he says that it was made into beer in those parts of Spain where the wine was not abundant. Malt and beer are both mentioned in the laws of the old Franks, and by many writers of the middle ages, yet so late as the fourteenth century, it is supposed to have been called *gruit* in the Netherlands. The same word is also made to signify an addition of herbs used in brewing, and likewise the beer itself; and it is remarkable, that when hops were first introduced, it occasioned a complaint that much less *gruit* was used than formerly. It is supposed that the Danes brought into this country a mode of procuring beer from the flowering tops of some species of heath; and so late as the fifteenth century, sweet-gale—*Myrica gale*—was used for that purpose in Sweden. But malt-liquor was known in England at an early period, and in the latter end of the thirteenth century, in the reign of Edward I., we find a grant of land from William Earl of Warwick to one Adam Underwood, one of the conditions of which was, that he should annually make for the lord of the manor *three quarters of malt.*

The fermented liquor anciently in use in this country is usually termed ale, but we have in fact no certain account of its composition, and all that is known respecting it is, that it was a pleasant, but intoxicating, beverage. Our Saxon ancestors were so addicted to its use, that, so far back as the time of King Edgar, it was found necessary to order marks to be made in their cups at a certain height, beyond which they were forbidden to fill under a severe penalty. This probably gave rise to the *peg-tankard*, of which there are a few still remaining. It held two quarts, and had on the inside a row of eight pegs, one above the other, from top to bottom, so that the space between each contained half a pint. The law of compotation was, that every one who drank was to empty the exact space between peg and peg, and if he either exceeded or fell short of his measure, he was bound to drink down to the next. It may be readily conjectured in what manner the enforcement of such a rule would be likely to operate among a jovial party; and accordingly we find in Archbishop Anselm's canons, made in the council of London A. D. 1102, an order by which priests were enjoined not to go to drinking bouts, *nor to drink to pegs:* the words are, "*ut Presbyteri non eant ad potationes,* NEC AD PINNAS BIBANT."*

Of the origin of that species of beer now so generally drank under the name of porter, the following account is given by the editor of the "Picture of London:"—

"Before the year 1730, the malt-liquors in general use in London were ale, beer, and two-penny; and it was customary to call for a tankard of *half-and-half,* that is, half of ale and half of beer or two-penny. In course of time it also became the practice to call for a tankard of *three-threads,* meaning a third of each; and thus the publican had the trouble to go to three casks for a pint of liquor.

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* It has been conjectured that from this custom has been derived the common saying "*he is in a merry pin,*" and the expression "*to take a person a peg lower.*"

To obviate this inconvenience, a brewer of the name of Harewood conceived the idea of making a liquor which should partake of the united qualities of those already mentioned. He succeeded, calling it *entire*, or entire butt, meaning that it was drawn from one cask, or butt; and as it was a very hearty and nourishing beverage, and supposed to be very suitable for porters, and other working people, it obtained the name of *porter*."

"So far back as the reign of Queen Anne, statutes were enacted by which penalties are imposed on brewers who should be convicted of adulterating beer; but during nearly a century there are but few records of any prosecutions for the offence. Of late years, however, the practice has become so prevalent, that numerous convictions have taken place for the employment of various drugs in the composition of ale and porter. Among these, the most common are, *alum* and *sulphuric acid*, to give an appearance of age; *capsicum*, *coriander*, *carraway-seeds*, and *grains of paradise*, to impart heat and flavor; with those deleterious substances, *opium*, *cocculus-Indicus*, and *nux vomica*, to increase the narcotic and intoxicating qualities. The frothy head, so much admired in porter, and generally considered as a proof of strength, is said to be in many cases produced by a mixture of ground copperas and alum. So openly, indeed, have these expedients been resorted to, that two practical brewers have publicly recommended their adoption, in popular treatises on the art of brewing; one of whom declares it to be his decided opinion, "that however pernicious or disagreeable they may appear, they are requisite in the brewing of porter, and must be invariably used by those who wish to continue the taste, flavour, and appearance of the beer."* In justice to the chief porter brewers of London, it must however be admitted, that they have not been implicated in the charge of adulteration.

In England, no other grain than barley is employed in the manufacture of beer, but in some parts of Germany a very agreeable liquor is made from wheat; and the Chinese are known to possess a kind of beer extracted from barley and wheat together, which is called *Tarasum;* to which it is also said that hops are added, which are formed by pressure into masses of the shape and size of bricks. This is the more probable, as they are known to preserve a particular species of tea in a similar manner. In Bohemia, also, hops are compressed in the same way; and it is said, will thus preserve their properties unimpaired for half a century. A square bag of two cubic ells will contain fifty bushels of hops when properly subjected to the operation of the press; the whole thus become one mass of a substance somewhat resembling pitch, in which not a hop-leaf can be discerned, and when they are required for use, a piece must be cut from it with an axe.

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* *Child, on Porter-brewing, p.* 7.

HORSE-CHESNUT TREE.

DESCRIPTION OF THE TREE;—MEDICINAL QUALITIES;—ORIGIN OF THE NAME;—PERIOD OF INTRODUCTION;—NATIVE SOIL.

Of all the ornaments of our parks and pleasure-grounds which have been obtained from foreign countries, there is none more beautiful than the wild chesnut. With a slight portion of care, it, in a short time, shoots up into a majestic tree, whose spreading branches and umbrageous leaves, crowned with pyramidal clusters of flowers, afford a delightful shade, while the delicate hue of its foliage relieves the darker tints of evergreens, and enlivens the gloom of the grove and shrubbery. Although a native of a more genial climate, it withstands the cold of our northern hemisphere, and often attains the age of more than a century; but its wood is of no utility, being scarcely fit even for the purposes of fuel, and the fruit is useless exept as food for some animals. When employed for this purpose, the nut is supposed, by the Turks, to possess the property of a restorative for broken-winded horses; and from that idea it acquired the name of *hippocastanum,* which we retain under that of horse-chesnut. In some parts of the Continent the bark is highly esteemed as a febrifuge, and is even by many considered equal to Peruvian bark.

This tree was obtained from Constantinople, and is supposed to have been first brought to Vienna soon after the middle of the sixteenth century. Its introduction is generally ascribed to the botanist Charles de l'Ecluse, in whose writings it is particularly described.* He says, that in 1581 it was still considered as a botanical rarity, but that in 1588 there was a plant of the species at

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* *Clusii,* rariorum stirpium per pannoniam Austriam et vicinas provincias observatarum historia; Antverp: 1583.

———, rariorum plantarum historia; Antverp: 1601.

Vienna, that had been brought there twelve years before, but had not yet produced bloom. In France, it was first reared from seed procured from the Levant, in the year 1615, by one Bachelier, whose flower-gardens at Paris were then celebrated. The largest tree of the kind in that country, and which was considered as the parent stock from which all others had been propagated, formerly existed in the gardens of the Temple.

Notwithstanding that the first knowledge of this exotic was acquired at Constantinople, it yet seems improbable that it was originally indigenous in that neighbourhood; for had it always grown there, it is to be presumed that it could not have remained so long unknown. No trace whatever is to be found of it in the writings of the ancients; and although it is supposed to be a native of Syria or Egypt, we have no certain account of its origin.

INDIGO.

DEFINITION OF INDIGO;—ANCIENT MANUFACTURE AND USE;—INDIAN INK;—BLACK DYES;—EMPLOYMENT OF INDIGO IN THE MIDDLE AGES;—JEWISH DYERS;—BENJAMIN OF TUDELA;—IMPORTATION FROM THE EAST INDIES;—CULTIVATION IN SPANISH AMERICA;—DEVIL'S DYE;—WOAD;—OATH OF THE NUREMBERG DYERS;—ADOPTION OF INDIGO.

THE dye-stuff termed "indigo" is a friable substance obtained from the fermented and desiccated juice of certain plants, known to botanists by the generic title of *indigofera tinctoria,* and is employed to impart the various tints of blue and purple. It appears to have been manufactured in the East-Indies from the earliest periods of which we have any authentic account, and it is remarkable that it still preserves its ancient appellation.

It is mentioned by the Greeks under the name of ινδικον, and by the Romans under that of *indicum*. It was obtained by them, like other Indian commodities, either through the Persian Gulph by the way of Babylon, or by the Red Sea through Egypt; and the description of its properties, recorded by the writers of antiquity, leaves no room to doubt of its having been the same substance with which we are acquainted, and which we still partly derive from the same source. It appears, however, that it was employed by the ancients both as a medicine and a pigment, as well as a dye; but for the two former purposes it has long fallen into disuse: not only are our physicians acquainted with more efficient remedies, but, as it is understood to be usually prepared in copper vessels, it is feared that its internal administration might be attended with dangerous consequences; wherefore it has been excluded from the *materia medica;* and, as it does not readily harmonize with oil, it has become useless to the generality of modern painters.

Ancient authors make a distinction between *indicum* and *indicum nigrum*, notwithstanding which, these have long been considered by commentators as one substance; but, on closer investigation, there seems to be strong reasons for supposing that the latter, or black indigo, was in fact what we call indian ink; and it even appears that it was used by the Romans, as it is to this day by the Chinese, for the purposes of writing.

Neither is it unworthy of remark, that among the black dyes known to the Romans were—lamp-black, made, in huts constructed for that purpose, from the condensed smoke of burning pine-wood, and ivory-black, manufactured from burnt-bones; both of which are still in use: and also a very peculiar species, which was procured by charring in a closed vessel the refuse grapes from which wine had been expressed, and then reducing it to powder; which is still practised in many parts of the Continent, where the dye thus obtained is termed *noir de vigne*, and is yet in the highest estimation.

That indigo continued to be imported into Italy during the middle ages, is sufficiently proved by the record of a treaty between the citizens of Bologna and those of Ferrara, written in Latin, and dated in the year 1193, in which the article *indigum* is enumerated among other merchandize subject to pay duty. The celebrated Italian Marco Polo, who, in the thirteenth century, passed twenty-six years in travelling through various parts of Asia, relates that he there saw the process of making indigo; but speaks of it as a dye with which he was already acquainted. The best sort was about that time known in Italy by the name of *indaco di Baldacca*; from which it has been conjectured that it was procured through the city of Bagdad, which, in some old books of travels, is also called Baldac.

The Italians, indeed, appear to have been the first people who brought the art of dyeing to perfection in Europe; but it seems also probable that they were instructed in it by the Jews, who themselves acquired it in the East, where it was in many respects carried to a degree of perfection which even the aid of chemistry has not yet enabled the moderns to attain. We have the authority of Benjamin of Tudela, who travelled through a great part of the Levant in the middle of the twelfth century, that the Jews possessed many dye-houses there, and were the chief persons who carried on that business, of which it appears they had a monopoly in the city of Jerusalem. It is indeed true, that the narrative of this traveller, who was himself a Jew, does not always obtain implicit confidence; but no reason can be assigned why he should exaggerate in this instance, and he only mentions two persons of his own religious persuasion who followed any other trade. As a proof that they carried it on in Italy, we find that, in the eleventh century, even the Popes derived a revenue from a tax paid by the Jewish dyers.

When a direct communication by sea was opened with the East-Indies, indigo was, no doubt, soon after imported into Europe by that route, for the travellers who visited India about that time mention it as one of the most common articles of trade: but no record remains of the assortment of the ship commanded by Vasco de Gama, or of those which immediately followed; and all we know of the early trade of the Portuguese in that quarter, is, that their vessels returned laden with spices and other costly articles. However, a Portugueze named Odoardo Barbosa, who afterwards accompanied Magelhaens on his voyage round the world, has left an account of the particulars of a price-current of merchandize at Calicut, in the year 1516, in which the value of the best indigo is stated at thirty *fanoes* the *farazuola.*[*] That this price was materially raised in the following century, or that the profits on this trade must have been enormous, we may collect from the fact, that in the year 1631 the importation of indigo into Holland, in seven vessels, amounted to 333,545 lbs., which were estimated as being worth, in Europe, at least 500,000 rix dollars, or, in English weight and money, nearly six shillings and fourpence per pound. In 1633, the value of the quantity imported was estimated at two millions of dollars, and the qualities were chiefly distinguished as *Sirches*, *Chirches*, *Bajano*, *Bejana*, and *Guzerat* indigo.

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[*] As the particulars of these prices may interest some readers, we here transcribe the original: *Endego vero et buono val la farazuola, fanoes xxx. Lacca di Martabani, che sia buona, val la farazuola, che è libre xxii. et sei oncie, et mezzo di Portogallo d'oncie xvi. la libra,—xvi fanoes.*—Ramusio, Navigazioni et viagge, vol. i. p. 323. By "*fanoes*" is to be understood the small East-Indian coin, commonly called a fanam; and by "*farazuola*" the weight usually termed a farcell.

It has been asserted by the Abbé Raynal, and other historians, that the indigo plant was carried from the East-Indies to America; it is, however, proved by the concurrent testimony of many Spanish authors, who wrote immediately after the discovery of the New World, that it was found at that period in the island of Hispaniola, and in Mexico; and that the natives of the latter even made a dye from it, with which they tinged their hair; but the genera of this plant are numerous, and whether that which is indigenous in America is the same as that which grows in the East has not been correctly ascertained. The first indigo that was received in Europe from America, came from the province of Guatemala, in the kingdom of Mexico, where it is still produced, of superior quality. Hispaniola was long the only island in the West-Indies where it was cultivated;

some establishments were afterwards made in Jamaica and a few other settlements; but all these have long been abandoned, on account, as it was said, of the manufacture being found prejudicial to the health of the negroes. It was attempted in Carolina in 1747, and was long carried on with apparent success; but, if not entirely relinquished, it languishes there at present, and this valuable product is now, in America, chiefly confined to the Spanish settlements in Mexico and Venezuela.

After the double discovery of America and of a passage by sea to the East-Indies had rendered indigo plentiful in Europe, it began to supersede the use of woad, which had previously been largely cultivated for the purpose of dyeing blue. About the same time, also, considerable improvements were made in the art, and new experiments were attempted, which did not always succeed. The consequence of the latter was, that the cloth was often spoiled; and the landholders, who had lost the sale of their woad, raised an outcry against all innovation on the ancient mode, which had such influence with the German Diet that a decree was published, in 1577, prohibiting the newly-invented, fraudulent, destructive, and corrosive dye, called the *devil's dye,* for which vitriol and other pernicious substances were used instead of woad. The same prohibition was revived in 1603, with this observation, that, in consequence of the weight of the bad dyes, a pound of undyed sewing-silk would produce two, or even three pounds when dyed. Allusion was no doubt made to black, as it is well known that cloth receives a greater addition in weight from that than from any other colour, and the next greatest from blue; but the assertion contained in the decree was doubtless an exaggeration, as a pound of white raw-silk only gains about three ounces on being dyed black.

The prejudice thus raised against the devil's-dye was not easily eradicated. In 1652, Ernest, Duke of Saxony, proposed to the Germanic Diet that an exclusive privilege should be granted to the dyers in woad; and this was followed by an imperial decree, in 1654, to prevent the introduction of indigo, " by which the consumption of woad was lessened, dyed goods were injured, and the coin was taken out of the country." The inhabitants of Nuremberg, who it seems were great dealers in woad, not deeming these prohibitions sufficient, passed a law that every dyer within their district should annually take an oath not to make use of indigo; and notwithstanding it is now quite as generally used there as elsewhere, the dyers of Nuremberg are forced to take the same oath to this day.

In France the same prepossession prevailed, and similar prohibitions were enforced, until the enlightened administration of Colbert, who, in 1669, permitted the use of indigo under some restrictions; but it was not until 1737 that full liberty was granted to the dyers to use it alone, or mixed with woad.

England, however, does not appear to have been infected with the same aversion to this foreign innovation, for in the year 1581, the twenty-third of Elizabeth, it was enacted, that no woollen articles should be dyed black with gall-nuts, madder, or other matters, "except the same be first grounded with woad only, or with woad and *anele*, alias *blue Inde*."* It was, indeed, long thought that a durable black could not be produced unless the article were first dyed blue; but that is an error which modern dyers have exploded.

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* "*Anele*, alias *blue Inde*,"—Indigo is called, by the Spaniards and Portugueze *anil*.

KITCHEN-GARDENS.

ANCIENT STATE OF HORTICULTURE IN ENGLAND;—ARTICHOKE;—BROCOLI, ASPARAGUS, AND CELERY;—SPINAGE;—SCORZONERA;—POTATOES;—JERUSALEM ARTICHOKES;—INTRODUCTION OF MODERN VEGETABLES;—HOT-HOUSES;—PINE-APPLES.

THE kitchen-gardens of England were as scantily supplied with vegetables, until about the end of the sixteenth century, as the pleasure-grounds and parterres were with shrubs and flowers. "It was not," says Hume, "till the end of the reign of Henry VIII. that any sallads, carrots, turnips, or other edible roots were produced in England; the little of these vegetables that was used, was imported from Holland and Flanders: Queen Catherine, when she wanted a sallad, was obliged to dispatch a messenger thither on purpose."

Hume, however, is not quite correct in supposing our ancestors before Henry the Eighth's time to have had no sallads. They had always their winter-cresses and water-cresses, and common Alexander's which served them instead of celery; they had rampion, and rocket of potent virtue; they had borage for their cool-tankard, and amaranthus, and goose-foot, or good Henry, with sprout-kales, which they used as greens; and, to crown all, when pepper was so dear, that to promise a Saint the yearly offering of a pound of it was considered as a rash vow, economical housewives seasoned their dishes with the leaves of pepperwort, which on that account obtained the name of poor-man's pepper. Their fruits, indeed, were neither numerous nor excellent, being chiefly confined to gooseberries, currants, and strawberries: what apples and pears they had were generally indifferent, and their plums and cherries bad; although the latter are supposed to have been planted in this country so early as the year 800, at which time they were brought from Italy.

Our most-esteemed vegetables of the present day, were, for the greater part, originally natives of the south; and many of them have only been naturalized in this climate by dint of perseverance and horticultural science. Some, however, are either indigenous plants, which have been improved by culture, or old species long forgotten, and since recalled into use under a different name. New varieties, also, of the same plant, are produced by continued cultivation, while old ones are at the same time disused, and at length even the parent stock is lost. Thus, although the ancients bestowed great attention on the kitchen garden, and were probably acquainted with a large proportion of the vegetables still in use, it has become impossible to reconcile the generic qualities of many plants, as they are described by the Greek and Roman authors, with the properties of those of the same species with which we are acquainted; and thus, at no very distant period, perhaps, some of the roots now in esteem may share the fate of the humble tribe that furnished the frugal tables of our forefathers.

Of those vegetables which we still rank among the finer sort, the *artichoke* is perhaps the oldest in this country. It was first noticed at Venice, in 1473, but it had been earlier known in other parts of Italy, and had been obtained from the Levant. It was introduced into France in the beginning of the sixteenth century, and thence into England in the reign of Henry the Eighth. The origin of its name has given rise to much learned controversy, but is yet undecided.

To Italy we are also indebted for *broccoli*, *asparagus*, and *celery*. The first came through France at the close of the sixteenth century; the other two did not reach England until near a century later, and were then procured from Flanders. Of these, asparagus is much the most ancient: it was known to the Romans long previous to the Christian æra; and, in Queen Elizabeth's time, it was, in this country, eaten "sodden in fleshe broth, or boiled in faire water, and seasoned with oile, vinegar, salt, and pepper, then served at men's table for a sallade."

The *cauliflower* was brought from the Island of Cyprus to Italy, and slowly found its way to the Netherlands, whence it was imported into this country towards the end of the seventeenth century; but the art of propagating it was not known, and the seeds were for a long time procured annually from the Levant by the Venetians and Genoese, who sent them to every part of Europe.

Spinage, we are supposed to have had from Spain; as, indeed, its original name "*hispanach*," would seem to imply. It is mentioned by writers of the fourteenth century among the food used in convents on fast days, but the period of its introduction into this country is unknown. *Scorzonera* is also a native of Spain, where it was discovered by a Moor in the middle of the sixteenth century, and used as an antidote to the poison of a snake called *scurzo;* but at present no one places any faith in its medicinal virtues.

The *potatoe* did not make its appearance in Europe till Sir Walter Raleigh brought it, towards the close of the sixteenth century, from America to Ireland, in which country it was first cultivated at Lismore Castle, the present seat of His Grace the Duke of Devonshire. From thence it passed, by slow degrees, over to Scotland and the northern counties of England; and has since become general throughout Great Britain. It is also getting into use in all our foreign possessions, and has even succeeded in overcoming the prejudices of the natives of India; but the lapse of two centuries has not sufficed to introduce it into common consumption in the south of Europe. For a long time after its introduction into this country, it was only planted in the gardens of the nobility, and it was looked upon rather as a curious exotic than a useful addition to our vegetable productions. In 1619, when its cultivation had become more general, its common market price was one shilling per pound.

Shortly after this period, another root, nearly similar in growth and appearance to the common potatoe, was obtained from Canada, and received the name of the *Jerusalem Artichoke.* How it acquired that appellation does not clearly appear, but its flavour certainly resembles that of an artichoke bottom. It was formerly a fashionable vegetable in England, and was sometimes served in a pie baked with marrow, raisins, spice, and sweet wine, but at present it seems to be almost entirely neglected.

Since that time our gardens have been enriched with a great variety of esculent plants. Palestine has furnished us with the *eschalot;* from the island of Cos we have obtained a delicate species of *lettuce;* and from other parts of the Grecian Archipelago, the *cucumber* and the *melon.* France has supplied the *beet,* the *radish,* and the peculiar *bean* which bears its name. We have only lately brought from Portugal the *tomato*, or love-apple; and we are indebted to the present Bishop of Carlisle for an early and elegant substitute for asparagus, in the culture of the *sea-kale*.

There yet, however, remain many valuable foreign vegetables, which are still strangers to our soil, but which, it is probable, only require to be known to become naturalized. Among these we may more particularly distinguish the *sweet-potatoe* of America, the nutritious *white-bean* of the Peninsula, and the delicate *aubergine* of Provence; each of which is produced in a climate not essentially different from our own. There are also, in Portugal, some peculiar species of the cabbage-tribe, which merit attention, and a small kind of pumpion, that might be cultivated with advantage.

That great improvement in modern gardening, the hot-house, was first adopted by the Dutch, who had also been long previously acquainted with the use of hot-beds, and the value of tanners'-bark in forcing early vegetation. It was introduced into this country in 1688, by Mr. Bentinck, an ancestor of the Duke of Portland, and is said to have been first employed in the neighbourhood of Blackheath, in the rearing of orange-trees. It was applied, not many years afterwards, to the forcing of pine-apples, for which we are said to be also indebted to the same gentleman.

This fruit is indigenous in the Western Indies, where it is known under the name of the *Anana*. It was found in the East-Indies and in China so early as 1578, but was said to have been carried thither either from the Brazils or from Peru. Attempts were for a long time unsuccessfully made to cultivate it in Europe, and it is supposed to have been first brought to perfection towards the commencement of the last century, in the garden of one De la Court, a celebrated florist at Leyden. It is still cultivated in Holland, and in many parts of Germany; but no where so generally or successfully as in England. In Italy and France it is but little attended to; and it is remarkable, that in Spain and Portugal, the countries to which it was originally brought, and the climate of which is so favorable to its growth, it is scarcely known but by report.

The invention of the hot-house has created a new æra in the horticulture of the north: by supplying us with the means of imitating the temperature of every climate, and of regulating it at discretion, it has afforded us the power of bringing the tenderest exotics to perfection, and has, in fact, nearly rendered us masters of the vegetable productions of the whole world.

PEAT.

ACCIDENTAL DISCOVERY OF THE USE OF TURF;—CONFLAGRATION OF MOORS;—ANTIQUITY OF THE USE OF PEAT;—TRADITION RESPECTING ITS DISCOVERY IN ICELAND;—CONJECTURES REGARDING IT IN ENGLAND;—SUPPOSED ORIGIN;—PROPERTIES;—CHARRING COAL TAR.

It is probable that the discovery of the aptitude of various kinds of earths for the purposes of fuel was made by accident. It often happens that turf-moors are set on fire fortuitously, and the conflagration thus occasioned generally lasts too long to escape observation. Many instances are to be found in the ancients of the earth taking fire in this manner. Of these one of the most remarkable is mentioned by Tacitus,* who relates, that the land in the vicinity of Cologne, in Germany, took fire, and burned with such violence, that the neighbouring villages and every production of the fields were destroyed by the flames, the progress of which was only arrested by the walls of the city. This circumstance cannot be attributed to volcanic eruption: it occurred in a morass; and there are still extensive bogs around Cologne from which turf is dug for fuel. The application of peat to this purpose, in the earliest periods, throughout the greater part of Lower Saxony and the Netherlands, is proved by Pliny's account of the Chauci, who inhabited that part of Germany, and who, as he tells us, pressed together with their hands a species of mossy earth, which they dried by the action of the wind, and used for all the purposes of firing.

Notwithstanding this positive testimony to the ancient use of turf, and the probability that the knowledge of so valuable an acquisition must have been regularly transmitted to succeeding generations, it is not a little remarkable that, not only does no mention of it occur during the early ages of modern history, but many writers ascribe its discovery to so late a period as the beginning of the thirteenth century. There is a tradition, indeed, in the Icelandic Saga, that the mode of preparing turf for fuel was discovered in the middle of the ninth century by Einar, Lord of the Orkneys, who thence obtained the name of *Torff-Einar;* but the oldest certain account of it is to be found in a grant made by an Abbot Ludolf, in the year 1113, to a nunnery near Utrecht, to dig turf for its own use in a part of his *venæ,* or *fenne;* which word, in the ancient Frisic language, signifies a turf-bog, and is still retained in the Dutch *veen.*

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* Tacit. Annal. lib. xiii. cap. 57.

In England, there seems to be some allusion to peat in the works of the venerable Bede, who died in 755; but the meaning of the word which he employs, *gagates,* has been disputed, and has been thought by some antiquaries to apply to cannel-coal. We find also, in the Saxon Chronicles, that, in the year 852, the abbot and convent of Peterborough demised the lands of Sempringham, in Lincolnshire, to one Wulfred, on certain conditions, whereof two are, that he should annually supply the monastery with sixty loads of wood, and twelve loads of *græfan*. This word, indeed, has been considered to mean fossil-coal, but there is no reason why it should not be equally applied to peat, which is *graven*, or dug, as well as coal; and this remark is strengthened by the fact that coal is not found in that neighbourhood.

Various hypotheses have been formed respecting the original formation of peat, or, as it is indifferently called, turf; the most probable of which seems to be, that it is an accumulation of vegetable matter in a state of decomposition. It is generally found in extensive beds, called in this country peat mosses, and in Ireland bogs, either occupying the surface of the soil, or covered to an inconsiderable depth with sand, gravel, and other alluvial substances. These abound in the northern, and in some of the central countries of Europe, and are not confined, as generally is supposed, to fenny plains, but extend as high as vegetation reaches in many moist uncultivated tracts of mountain. This is particularly the case in Ireland; and in some parts of the western shore of Great Britain they run into the sea to an unknown extent. The depth of these mosses varies from a few feet to twelve or fifteen yards. Their consistence is equally uncertain, being sometimes in a semi-fluid state, studded with scattered tufts of rushes; but when more solid, they are scantily covered with heath, and coarse grasses, and are then passable during the dry season, by sheep, and sometimes by larger animals. In deep bogs it is found that the upper part of the peat is less inflammable than that at the bottom. When of good quality, it is moderately compact, and is usually cut with sharp spades into solid masses of the size and form of bricks. It dries slowly by exposure to the air, and is in that state used for firing; it kindles rapidly, burns with a bright yellowish flame, and forms an agreeable fire; but it consumes quickly, and does not throw out so much heat as coal.

Various attempts have been made, on the

continent, to substitute the charcoal of peat for that of wood; and it appears to have been satisfactorily proved that a given bulk of the former burns longer, and affords a more uniform heat than the latter; but it seems to be incapable of resisting the action of a forge bellows, and is said to deteriorate the quality of iron that is smelted by it. The process also of reducing it to charcoal is more expensive than that employed for wood: furnaces must be built of a peculiar construction, and the quantity of fuel consumed in the operation is so large, that the establishments for that purpose have been generally abandoned. This method of charring turf seems to have been employed at the smelting houses at Freyberg, in Germany, so far back as the middle of the sixteenth century, and is still practised in some parts of Bohemia, Silesia, and Upper Saxony: it affords, at the same time, an ammoniacal liquor and strong empyrheumatic oil. A somewhat similar method is employed in England to obtain rock oil and tar from pit-coal; and a patent was, some years ago, obtained for this process as if it had been then a new invention; the fact, however, is, that similar experiments were made on a large scale, at Windsor, by a German named Joachim Becher, so long since as the year 1669.

PIT-COAL.

ANTIQUITY OF THE USE OF COAL;—NEWCASTLE PITS;—SUPPOSED ORIGIN OF COAL-BEDS;—WHITEHAVEN MINES;—FOREIGN MINES;—SALT-MINE OF WIELITZKA;—RAILWAY ROAD.

FOSSIL coal is found in various parts of Europe and America, but in no place of equal quality to that produced by some of the mines in England. The antiquity of its use as an article of fuel is uncertain; but it is supposed to have been earlier known in this country than on the neighbouring continent.

In Brand's history of Newcastle, it is said, that the first record of the use of sea-coal in Britain occurs in the thirteenth century, in the reign of Henry III.; but it has been doubted whether traces of it may not be found at a much earlier date. The island having been for a long time partly covered with forests, there can be no doubt that wood was then generally employed for firing; but we are not to conclude, from this, that the use of coal was unknown. On this subject Bishop Watson observes, in his chemical essays, that "there is good reason to believe that the Newcastle coal-pits were wrought in the time of the Romans, for coal-cinders have been found at the bottom of the foundation of a city built by the Romans in that country; but whether they were not wrought by the Britons, before the Roman invasion, is a question which cannot, perhaps, be decided either way." It appears probable, indeed, from other authorities, that British pit-coal was known at that æra; and there is a remarkable passage n the works of Solinus, who is supposed to have written in the fourth century, which appears to bear an indirect allusion to it. Speaking of the warm springs at Bath, he says, "*Quibus fontibus præsul est Minervæ numen, in cujus æde perpetuo ignes nunquam canescunt in favillas, sed ubi ignis tabuit, vertitur in globos saxeos.*" These *globi saxei* can certainly only be interpreted as coal-cinders, for *favillæ*, or the ashes of wood or turf, contain no particle of stony matter; pit-coal, besides, is not uncommonly translated into Latin by *carbo saxeus*, and it is well known that the part of Somersetshire in the vicinity of Bath abounds with that substance.

Geologists entertain various opinions respecting the origin of coal. It is commonly found in masses disposed within the earth with different degrees of inclination, and in every variety of direction. These beds are by many imagined to be a deposit formed by the waters of the ocean at the period of the deluge. Some suppose them to have been produced by the decomposition of the soft parts of that immense quantity of organized matter, of which we almost every where find some remains: though opposed to this conjecture is the fact, that vegetables scarcely decomposed are sometimes found in the centre of coal-beds; besides the want of experiments to prove that organized bodies give out bitumen during their decomposition. Others consider them as a mineral production: but the most generally received theory is, that coal was formed at the same time, or after the existence of organized bodies; that it was originally liquid; and that the cause of its formation was the same over the whole earth, since the strata always exhibit nearly the same phenomena in their structure and circumstances. It is, indeed, apparent that this substance has not been deposited by any violent revolution of nature, since the extraneous matter found in it is generally in the most entire state, and the slaty kind of stone by which it is so frequently accompanied, often contains the impression of plants, and particularly of ferns, in the finest tate of perservation.

England abounds with mines of this useful fossil, the principal of which are those of Newcastle and Whitehaven. London is chiefly supplied from the former, and the dealers distinguish not less than seventy different kinds which are usually brought to market, a considerable portion of which is however received from the port of Sunderland.

Those of Whitehaven, although not so valuable as those of Newcastle, either for the amount or quality of the coal, are the most worthy of notice for the peculiarity of their construction. The main entrance is by an opening at the foot of a hill, through a long passage hewn in the solid rock, which, by a steep descent, leads to the lowest pit. The greatest part of this descent passes through spacious excavations, in the different strata that have been already worked, which form huge galleries, supported by massive pillars of coal left standing for that purpose. These, in the deepest veins, are three yards high and twelve square, this great solidity being deemed necessary to support the vast superincumbent weight. The mines have been already sunk to the depth of nearly eight hundred feet below the surface of the earth, and are extended under the sea to places where the water above is of sufficient depth for ships of the largest burden. They are the deepest coal-mines that have been ever wrought, and perhaps in no part of the world have miners penetrated so far beneath the level of the ocean; for the mines in Hungary and Peru, and that of Fahlun, in Sweden, all so celebrated for their vast profundity, are situated in mountainous countries where the first strata are found at a great elevation; and the salt-mines at Wielitzka, in Poland, which have been often considered as the deepest in Europe, have not reached within one hundred feet of the depth of the coal-pits of Whitehaven.

The road from these pits to the port is on a gentle declivity, provided with an iron railway: this, by diminishing the friction, so facilitates the carriage of the coals, that, when the waggons are filled, they run without assistance till they arrive at the quay, where the bottom striking out, by the pressure of some machinery contrived for that purpose, the load is at once discharged into a flue which communicates with the hold of the ship intended to receive it: the waggons are then carried round by a turn-frame, and drawn back to the mine by horses.

SAFFRON.

CROCUS;—ANCIENT USE OF SAFFRON;—PERFUMES;—ORIGIN OF THE NAME;—INTRODUCTION INTO ENGLAND;—CULTIVATION;—ADULTERATION;—EDICT OF HENRY II. OF FRANCE.

It frequently happens that, when treating on botanical subjects, the moderns apply ancient names to objects of a different nature from those known to the Greeks and Romans under the same denomination; but every thing that we read in authors of antiquity regarding the *crocus*, agrees in all respects with the properties of our saffron. It is described as a bulbous root, which grew wild in the mountains, and of which there were two species, one that flowered in the spring, the other in autumn; and it was used both as a medicine and a dye, as well as for sea soning various kinds of food.

It is still occasionally employed for all those purposes; but that which, in its ancient use, appears the most discordant to modern taste, is the profusion with which it was lavished as a perfume. It formed part of the composition of many vinous extracts which retained the scent; and not only were the persons of the Roman fashionables sprinkled with it, but it was made to flow in streams over their palaces, their public halls, and theatres, and the courts of their houses were strewed with the flowers. Scented salves were also made from saffron, combined with wax and other ingredients, the receipt for which is to be found in the writings of the Grecian physician Dioscorides; and so highly were these esteemed, that the poet Catullus thus speaks of some which he sent as a present to a friend:—

Nam unguentum dabo quod meæ puellæ
Donarunt veneres Cupidinesque,
Quod tu, quum olfacies, deos rogabis,
Totum ut te faciant, Fabulle, nasum."

Fabullus, sweetest ointment thou shalt have,
Which, to my fair, the Loves and Graces gave;
Inhaling which, the Gods thou'lt teaze with vows
That thy whole frame be changed into a nose,

That saffron was commonly employed by the Romans for culinary purposes, appears from the oldest work on cookery now extant, which is usually, though perhaps erroneously, ascribed to Apicius; and it still enters into the composition of many favorite dishes on the Continent. Its medicinal use was also long continued, as the early physicians adopted the pharmacopeia of the Greeks; and it appears that it was at that period imported from the Levant.

Notwithstanding this general consumption of the plant, it does not seem to have been cultivated in Europe at the period to which we have alluded. In medical prescriptions, of even a much later date, it is styled *crocus orientalis,* and there is reason to suppose that it was first introduced into Spain by the Arabs; which conjecture is strengthened by its modern appellation, which is derived from the Arabic, or perhaps the Persian, *zae'feran.* In Mariana's history of Spain the origin of the present name is, indeed, ascribed to the Vandals; but the learned author assigns no ground for the assertion, which is, besides, irreconcilable with probability. Tradition says, that it was first brought to England in the reign of Edward III., by a pilgrim from the East, who hid a root of it in a hollow space, made for that purpose, in his palmer's staff; and that, had this been discovered in the country whence he took it, he must have paid the forfeit of the venture with his life.

The cultivation of saffron, however, became so important to European husbandry in the fifteenth and the following century, that it is mentioned by all the writers on agricultural subjects of that period. It appears, also, that it was at that time, as it is still said to be, adulterated with various extraneous substances, and attempts were made in different countries to restrain this imposition by penal regulations. An edict of Henry II. of France, of which the following is an extract, issued for that purpose in 1550, shows some of the means resorted to in this fraud, and the importance that was attached to it:—

"For some time past," says the edict, "a certain quantity of the said saffron has been found adulterated, disguised, and sophisticated with oil, honey, and many other mixtures and sophistications, in order that the said saffron, which is sold by weight, may be rendered heavier: other herbs are also added, resembling the colour and fibres of overdressed beef, which saffron, thus mixed and sophisticated, cannot be long preserved, and is prejudicial to health; and besides the said injury, prevents foreign merchants from purchasing it, to the great diminution of our revenue, and to the detriment of foreign nations: against which we hereby," &c. &c.

TOBACCO.

INTRODUCTION AND PROGRESS OF TOBACCO;—OPINION OF KING JAMES I.;—SINGULAR WILL;—CULTIVATION IN GREAT BRITAIN;—PERIOD OF INTRODUCTION;—DISCOVERY OF VIRGINIA;—SNUFF AND SNUFF-BOXES.

WHILE that invaluable root, the potatoe,* has but now, as it were, crept out of Ireland, another plant, derived from the same source, and introduced at the same time, nauseous in its taste and noxious in its qualities, spread itself with such rapidity, that in as many years as the potatoe required ages, it was found in a state of cultivation in the remotest corners of the world. The most inveterate prejudices fled before it; and in spite of prohibitions and denunciations, it prevailed in India, Persia, China, and Japan. So universal, indeed, was the use of tobacco in all these countries, and so very dissimilar were the instruments through which its smoke was inhaled in each of them, and at the same time so unlike those made use of in Europe, that if the introduction of the plant could not be traced, step by step, in the most satisfactory manner, it would be difficult to believe that it was not indigenous in them all. Yet it met with no encouragement from the ruling powers in any of them; the Emperor Jehan-Geer denounced it as a pernicious and poisonous European herb; the governors of the provinces of China did the same, but to little purpose; and in England, even the whole weight of royal antipathy, displayed in the famous "counterblast to tobacco," of James the First, with all the heavy imposts laid upon that "inchanting Nicotian drug from the Indies," were found too feeble to check its importation and consumption. "Whenever a fog came on," says the historian Howell, "during the time that the King was hunting, he used to say that Beelzebub was smoking tobacco;" and his Majesty concluded his invective with pronouncing the use of it to be "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and, in the black, stinking, fume thereof, nearest resembling the horrible Stygian smoke of the pit that is bottomless!" Nor was the King at all singular in his aversion to this novel luxury, as we may collect from the will of a Mr. Campbell, of Derbyshire, dated 20th of October 1616, in which there is this extraordinary clause:—"Now for all such householde goods at Darley, whereof John Hoson has an inventory, my will is, that my son Roger shall have them all toward housekeepinge, on this condition, that yf at any time hereafter any of his brothers or sisters shall fynde him takeing of tobacco, that then he or she so fyndeing him, and makeing just prooffe thereof to my executors, shall have the said goods, or the full valewe thereof, according as they shall be praysed by my executors for that purpose."—"In Ireland," observes the same author, "this weed is taken excessively in sneezing, which the husbandman at the plough-tail, and the servant-maid at the washing-block, suck into their nostrils to beget new spirits." It is more than probable, indeed, that it was this "begetting of new spirits," or the pleasure imparted by a state of intoxication, which could alone have overcome the nauseous and repulsive flavor of this plant. There are few nations, civilized or savage, that do not conquer their aversion to substances, however disgusting, which produce this effect; and it has been observed, that, where no discovery of spirituous liquors, or other substances capable of producing intoxication, has been made, the people are in the habit of dancing and whirling round till the brain turns, and they fall through giddiness.

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* For the introduction of "*the potatoe,*" see the article Kitchen-Gardens.

Tobacco has been cultivated with success in different parts of Great Britain, and the soil and climate of Ireland are considered peculiarly favorable to its growth. But its great importance to the revenue, and the supposed difficulty of preventing frauds on the excise if it were allowed to be planted, has occasioned an act of the Legislature to prohibit its cultivation. Whether this, in the present state of our agriculture, is sound policy, and whether the duty might not be secured in the same manner as that already levied on hops, it is not our present object to inquire; but we may be permitted to observe, that in many parts of the Continent of Europe, where its growth is not restricted by penal enactments, it has had a most beneficial influence on the prosperity of the landed interest.

Some doubt exists in regard to the exact period of the introduction of the plant into this country; as Stow tells us, "that Sir Walter Raleigh was the first who brought tobacco into use, in 1578, when all even wondered what it meant:" but he afterwards says, "that tobacco was first brought and made known in England by Sir John Hawkins, about the year 1565, but not used by Englishmen in many years after; though at this day (1631), commonly used by most men, and many women." On this subject it may be observed, that both the dates mentioned by Stow are probably incorrect, for at neither period had that part of North America in which tobacco is chiefly produced, and from which it no doubt was first obtained, been visited by the English. This province, then called by the natives Wigandacoa, was first examined, if not discovered, by Raleigh, about the year 1583; and was by him styled Virginia, in honor of his virgin mistress, Queen Elizabeth. He afterwards repeatedly visited that country, where he settled the first colonies; and the introduction of the plant is generally, and with every appearance of probability, attributed to him.

The consideration of tobacco naturally leads to that of snuff and snuff-boxes. Of the former we know little more than that it was in use soon after the introduction of the leaf itself. In common with most articles of daily consumption, it is said to be generally adulterated with various other less costly substances; but it is questionable whether any can be of less intrinsic value; and the lamentations of the amateurs of "Prince's mixture," "Hardham's thirty-seven," and "Irish blackguard," on the frauds thus practised on their sternutatory organs, are entitled to but little sympathy, unless, indeed, it be true, that some of these ingredients are deleterious compounds of ground glass and hellebore.

The caprices of taste and fashion have occasioned as many changes in the size and form of snuff-boxes as in the quality of snuff. With a splendid box, and the various graces of opening, presenting, and playing with it, a man of fashion displays his taste, his breeding, and his rank; it imparts an air of additional gravity and wisdom to the learned and the profound; if it does not absolutely furnish ideas, it at least often supplies the want of them; and, by a judicious use of it, many a coxcomb has saved his credit and his wits, when put to a pinch for an argument or a repartee. The possession of a valuable or uncommon box confers a certain degree of dignity and consequence on the owner; and when given as a present, it is always considered as a mark of peculiar friendship, or the reward of uncommon merit. There are, therefore, few objects of personal luxury on which such sums have been lavished as on these baubles, and none on which the ingenuity of artists has been so much exerted:

goldsmiths, jewellers, miniature and enamel painters, have rivalled each other in ornamenting them; and a collection of snuff-boxes, chronologically arranged, from the antique and capacious Highland mull, to the elegant *tabatière* of a modern beau, would tend to illustrate the history of the arts in Europe during the last two centuries.

TURKEYS.

MELEAGRIS GALLINA AFRICANA;—CONJECTURES RESPECTING THE ORIGIN OF THE TURKEY;—EARLIEST DESCRIPTION OF THE BIRD;—INTRODUCTION INTO THE EAST-INDIES AND AFRICA;—INTO ITALY;—INTO FRANCE, GERMANY, AND ENGLAND.

It is generally admitted, that the bird which we denominate a "turkey" was not, originally, a native of Europe; but much difference of opinion exists respecting the time of its introduction, and the country from which it was obtained.

The question whether this fowl was known to the ancients, depends upon the definition of the word *meleagris*, which has been commonly supposed to signify the turkey. But it has been justly remarked by naturalists, that all the ancients have related of the *meleagris* can only be properly applied to the *gallina Africana*, or Guinea-hen, with which there is no doubt of their having been acquainted. In many respects, indeed, these birds bear so close a resemblance to each other, that a common description might apply to either. Thus, the figure of the *gallina Africana*, its drooping tail and naked head, the fleshy excrescence on its bill, its unpleasant cry, and unsocial disposition, as detailed by Clytus, the disciple of Aristotle,* all correspond with the turkey; but the small pearly spots on the feather, the size, and the curved form of the back, mentioned by the same author, are peculiar to the Guinea-hen; and, above all, he has not noticed, in his account of the *meleagrides*, those remarkable distinctions between the male and female—the strut of the cock with his outspread tail, the changeable hue of the membrane that hangs from his bill, and the tuft of hair upon his breast; all of which are too apparent to have escaped observation, and belong exclusively to the turkey. The distinction drawn by Columella and

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* *Athenæus*, in Deipnosoph, lib. 14.

Pliny between the *meleagris* and the *gallina Africana* is so immaterial as scarcely to indicate more than a slight difference in the same species; and it has been supposed by Professor Pallas, with every appearance of probability, to apply to a variety of the latter, which bears a red crest, and is known as the *Numida mitrata*. Ancient authors assure us, besides, that the *meleagrides* were indigenous in Africa, which is the case with respect to Guinea-fowls, but where our turkey was never yet found wild. It seems clear, therefore, notwithstanding the assertion of the Hon. Daines Barrington, who has maintained a contrary opinion, that this bird was not known to the Greeks and Romans.

This gentleman seems also to think that the name which has been given to this fowl designates its origin, and therefore that we should consider it as a native of Turkey: but the same reasoning would apply to maize, or Turkey-corn, as it is frequently called, although it is well known to have been obtained from America; and they who are conversant in inquiries of this kind, are aware that many new and curious articles formerly acquired their names from countries to which they do not really belong. He has also erroneously adduced the testimony of Leland, the antiquary, in aid of his assertion, that turkeys were known in this country in the fifteenth century; for that author having mentioned, in his Itinerary, that *capons of grease* were served up at an entertainment given to Edward IV., in 1647, he has fancifully insisted that the expression should be read "*capons of Greece,*" which, thus converted, would mean turkeys.

It may also be here remarked, that Buffon has fallen into an error respecting the *gallinæ Africanæ* transmitted from the Romans, which, he says, became extinct in Europe in the middle ages; whereas, mention is made of them in English writers under the name of *Aves Africanæ*, about the year 1277.*

The most satisfactory conjecture that has been formed on this subject, ascribes the origin of the turkey to America; in support of which we have the following proofs:—

The first description that has been given of it by any modern author is found in an account of the Western Indies, by Gonzalo di Oviedo, who wrote about the year 1525, that is, within thirty years after the discovery of America by Columbus. He describes it with great minuteness and accuracy, and with all that interest which a rare object might be supposed to excite, but which would have been absurd had the bird been already common in Europe; and, being even at a loss for a name by which to designate it, he calls it a large species of peacock, the flesh of which, he says, is better than that of the Spanish peacock. Lopez de Gomara, whose history of Mexico was first published in 1553, also mentions it as peculiar to the newly discovered continent, and says that it was termed *Gallo pavo*, from its resemblance both to the peacock and the domestic cock; and there are various passages to the same effect in other Spanish authors. The earliest travellers who visited the northern shores of America found the turkey there in a wild state. Kalm, who visited Pensylvania in 1748, says that they run about there in the woods; and Smyth, who travelled through that country at a later period, assures us that they are to be found in the uncultivated wastes at the back of Virginia, in flocks of many thousands. It is also said, that they are larger and better flavoured than those bred in Europe.

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* See Kennet's Parochial Antiquities, p. 287.

As these birds are at present found in both Asia and Africa, and as these quarters of the globe have by many been considered as their native countries, it may not be uninteresting to inquire at what period they were carried thither. We are assured by Du Halde, that turkeys were not indigenous in China; although he erroneously adds, that they were common in the East-Indies. There is little doubt that they were carried to Persia by the Americans, and to Batavia by the Dutch. In the time of Chardin, they were, indeed, so scarce that they were kept as curiosities in the Emperor's menagerie; and he tells us, in his travels, that they were originally brought from Constantinople to Ispahan, by some Armenians, who presented them to the King as rarities. Instead, however, of recompensing them, his Majesty, observing that the Persians were ignorant of the proper treatment of the fowls, imposed upon the

Armenian donors the further trouble and expense of preserving them. In the kingdom of Congo, on the Gold Coast, and at Senegal, there are none but those belonging to the European factories, and various authors state that they are equally scarce in other parts of Africa. In the relation of Cavendish's voyage, in 1588, it is particularly mentioned that they found "*guiney cocks, which we call turkeys*," on the island of St. Helena; and Mr. Barrington misapplies this circumstance, in support of his opinion that these birds were not originally brought from America. But the name of "guiney cocks" belongs to what are now commonly called pintados; and, even admitting that they were turkeys, it would not be surprising that they should have been found there, as the island had been previously visited by the Portuguese, to whom this fowl had been long familiar.

These proofs are doubtless of themselves sufficient to satisfy any naturalist respecting the native country of these birds: but they will be strengthened if we consider the time and manner of their introduction into other places.

Had they come from Asia or Africa, many centuries ago, there can be no doubt that they must have been common in Italy, and would thence have been dispersed over the rest of Europe: but it does not appear that they were known there previous to the discovery of America. They are not alluded to before that period, by writers on agriculture who describe domestic poultry; and the earliest mention of them, in that country, occurs in an edict, issued in 1557, by the Magistrates of Venice, for repressing luxury, in which those tables are enumerated at which alone partridges and turkeys were allowed.

Some writers, indeed, have asserted that turkeys were known at a much earlier period in France; but no proof of that has been adduced. In a description of the duchy of Burgundy, by Messieurs Courtpée and Beguillet, it is very confidently said, that they were brought from Artois to Dijon in 1385; but no authority is assigned. And, in the same work, it is also asserted, that they were brought from the Levant, in the fifteenth century, by Jacques Cœur, to his estate of Beaumont, in the Gatinois, and by Americus Vespucius to Portugal. This Jacques Cœur was treasurer to Charles VII.: and was by him banished the kingdom in 1450. It is true that he then went to reside in the Levant; and M. de la Mare, in his treatise on the police, repeats this story of his having brought turkeys to France *on his return from banishment:* unfortunately, however, for its correctness, he never did return, but died in exile at the island of Chio in 1456. Another tradition, which, although not proved, appears more probable, is, that they were first brought to France by Admiral Chabot, the discoverer of Newfoundland, in the beginning of the sixteenth century. The prevalent idea in France, that they were introduced by the Jesuits, seems altogether void of foundation. They were so scarce in that country in 1570, that they were considered a splendid rarity at the wedding dinner of Charles IX. And the same monarch, on passing through the city of Amiens, condescended to accept from the magistrates a present of twelve turkeys.

Indeed, so late as the reign of Henry IV. we find that some dealers were punished for defrauding the country-people of these fowls, under pretence that they were for the use of the Queen.

Several authors assure us that turkeys were brought to Germany so early as the year 1530; but Gesner, who published his ornithology in 1555, seems not even to have seen them.

There is no certain account of the period of their introduction into England; they are not mentioned either in the list of Archbishop Nevil's feast, or in the Earl of Northumberland's household book, published in 1512; nor in the minute regulations of the royal kitchen, in the early part of the reign of Henry VIII., although all the fowls there used are enumerated. But it is probable that it took place soon after that time: some authors say in 1530, others in 1532; and, in Baker's Chronicles, it is ascribed to the year 1524. That they had become general towards the latter end of the same century, may be collected from the following lines in

Tusser's hundred points of good husbandry, printed in 1585 :*

> " Beefe, mutton, and porke, shred pies of the best,
> Pig, veale, goose, and capon, and *turkey well-drest* ;
> Cheese, apples, and nuts, jolie carols to heare,
> As then in the countrie, is counted good cheare."

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* There was an earlier edition of this work printed in 1557, but whether it contained the lines above quoted has not been ascertained ; in later editions they have been altogether omitted.

TULIP-MANIA.

ORIGIN OF THE TULIP, AND DERIVATION OF THE NAME;—DESCRIPTION;—CULTIVATION;—SINGULAR TRAFFIC IN THE ROOTS;—CONSEQUENCES;—EXTRAORDINARY VALUE OF SOME RARE SPECIES.

The tulip is found wild in many parts of the Levant, and has obviously derived its present name from the resemblance it bears to the form of the Turkish turbàn, which, in the language of that country, is termed *tuliband*.

This gaudy flower is generally supposed to have been first cultivated in Italy, about the middle of the sixteenth century; but it has been also conjectured, that the first roots were brought from Constantinople to Prague in 1554. It was, certainly, first described by a German botanist, Conrad Gesner, and was introduced into England, at the close of the sixteenth century, from Vienna.

In its uncultivated state, the tulip is nearly of one vivid colour, with large leaves, and an extraordinary long stem; but, on being transplanted, the petals become smaller, the tints assume a softer and more variegated glow, and the leaves a paler green. It thus, by continued culture, diminishes in size, and becomes weaker as it acquires new beauties, and it is not without the most skilful care that it can be preserved.

No people in Europe have bestowed so much attention on the cultivation of this plant as the Dutch; and, at one time, it formed the object of a trade throughout Holland, unparalleled in the history of commercial speculation. A single root of a particular species, called *the viceroy*, was exchanged for the following articles—two lasts of wheat, four of rye, four fat oxen, three fat swine, twelve sheep, two hogsheads of wine, four tons of beer, two tons of butter, one thousand pounds of cheese, a complete bed, a suit of clothes, and a silver beaker; altogether of the value of *two thousand five hundred florins*, or about two hundred and twenty guineas. A part only of *Admiral Van der Eyk* cost one thousand six hundred florins; and a portion of *Admiral Liefken* was sold for four thousand four hundred florins. It once happened that there were only two roots of that kind called *Semper Augustus*—the one at Haarlem, the other at Amsterdam; and the possessor of one of these—resolved to become the sole proprietor—purchased the other for four thousand six hundred florins, together with a carriage and a pair of horses. Other sorts were sold so high as seven thousand florins. This traffic, which was whimsically, and not unaptly, termed the *tulipomania*, has been generally misrepresented. It is laughed at, because people imagine that it was the beauty and rarity of the flowers that commanded the high prices at which they were sold, and that they were purchased at such extravagant rates merely to ornament gardens: but this supposition is erroneous. Not only mercantile men, but the first noblemen, citizens of every class, and mechanics of every description, were alike engaged in it. In every town some tavern was appointed as an exchange, where high and low, rich and poor, all traded in tulips, and confirmed their bargains with the most expensive entertainments. But no one wished to obtain actual possession of the flowers; and during the continuance of the tulipomania, one speculator often paid large sums for plants which he never meant to receive, while another entered into contracts for the delivery of roots which he never possessed. In order to render this intelligible, let us suppose that a merchant contracted to deliver a well known species of tulip-root, at the end of six months, for the sum of one thousand florins. Within that period, the value of that particular kind of tulip, must have either risen, or fallen, or remained stationary. At the expiration of the time, if the current price had risen to one thousand five hundred florins, the purchaser gained so much by his bargain, which sum the merchant paid to him instead of delivering the flower; but if, on the contrary, the tulip could be bought for eight hundred florins, the purchaser lost two hundred, and paid them to the merchant. If no alteration had taken place in the current price, then neither party won or lost. It was thus a mere gambling transaction, in which the difference between the market prices at two stated separate periods was paid, instead of the article itself being delivered; and, in fact, exactly resembled those operations on the Stock-exchange called time-bargains.

This traffic was in its zenith from the year 1634 to 1637; and so great was the mania for dabbling in it, that low-priced tulips were procured, and the roots of more valuable species were divided into minute imaginary portions, to accommodate every class of speculators. Ere the season expired, more roots were sold and contracted for than perhaps were to be found in all the gardens of Holland. When the *Semper Augustus* could not be procured, which happened twice, no species was so much the object of speculation; but the root itself was, in fact, quite out of the question; and we are told, that in one town alone, the contracts for tulips during the three years which the trade lasted, amounted to a sum nearly equal to a million sterling! Some of the poorest people thus acquired large sums, which they lavished with ludicrous profusion; and, as the prices had constantly continued rising during the first years, almost every speculator was, at some period, a winner.

But at length the bubble burst: no new adventurers appearing in the market, the buyers took the alarm; the value of tulips fell with more rapidity than it had risen; the sellers then offered to deliver the roots in substance at the prices agreed on; but the purchasers had no desire to receive them at any rate, and refused to fulfil their contracts. The States of Holland were at length obliged to interfere: a compromise was effected between the parties; and, as in the outset nearly all were winners, so in the winding-up very few escaped without loss.

But, although the extravagance of the tulipomania has thus ceased, the passion which gave birth to it still exists in a lesser degree; and tulips of any rare species yet bear a high value. In illustration of which we are told, that a Dutch merchant, to whom a sailor had brought a package, having ordered some herrings to be given to him for his breakfast, the man seeing what he conceived to be onions lying in a corner, ate a few of them as a relish; but these proved to be tulip-roots, of such value that, it is remarked, the merchant might more cheaply have entertained the Prince of Orange: and an English botanist, while strolling through a Dutchman's garden, having carelessly pulled a couple of tulips, was arrested as a thief, and forced to pay a considerable sum for his liberation.

VINES.

WILD VINES;—ANCIENT CULTIVATION OF THE VINE;—LIBATIONS OF THE ROMANS;—INTRODUCTION OF THE VINE INTO HUNGARY AND FRANCE;—ANCIENT VINEYARDS IN ENGLAND.

VINES were found in a wild state in the island of Sicily in the remotest ages, and as vineyards are mentioned by the ancient prophets and poets, there can be no doubt that the value of the plant was among the earliest discoveries in horticulture; but the origin of the cultivated grape is involved in the mystery of fable. Greece may be considered as its parent country, and it was from thence that it was introduced into Italy. It was, however, so rare during the early period of the Roman Commonwealth, that Pliny attributes the libations instituted by

Romulus—which were of milk—and the prohibition by Numa to pour wine upon the funeral pyres in honor of the dead, to the scarcity of vines. Vineyards were afterwards, however, so multiplied, that they interfered with the more necessary cultivation of grain; and the Emperor Domitian not only ordered the reduction of those already in existence, but forbade all new plantations.

The vine was introduced into Hungary and Gaul during the reign of the Emperor Probus. The vineyards of Burgundy are presumed to be as old as the age of the Antonines; and the district of Beaune, still esteemed for the quality of its wine, is supposed to have been celebrated by the Romans.

It would tend to little purpose to pursue this inquiry farther; but we cannot conclude without observing, that there are many grounds for conjecturing that the vine was cultivated at a remote period in this country. The question has, indeed, given rise to much discussion, and the fact has been warmly disputed; but a strong presumption in favor of it is to be found in the term *vineyard* being applied to many ancient spots in various parts of the kingdom: among others, at Denny Abbey, in Cambridge: *Vine streets* in East-Smithfield, and in Piccadilly; the *vineyard* near Houndsditch, in Southwark, and at Richmond, in Surrey; all which places were, in all probability, formerly gardens belonging to the palaces of the nobility.

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LONDON:
PRINTED BY COX AND BAYLIS,
GREAT QUEEN STREET, LINCOLN'S-INN-FIELDS.

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PRINTED BY COX AND BAYLIS, GREAT QUEEN STREET,
LINCOLN'S-INN-FIELDS.

A

CONCISE HISTORY
OF
ANCIENT INSTITUTIONS, INVENTIONS, AND DISCOVERIES
IN
SCIENCE AND MECHANIC ART;

Abridged and translated from the

Beyträge zur Geſchichte der Erfindungen

OF

PROFESSOR BECKMANN,

Of the University of Gottingen:

WITH VARIOUS IMPORTANT ADDITIONS.

IN TWO VOLUMES.

VOL. II.

LONDON:
PRINTED FOR G. AND W. B. WHITTAKER,
AVE-MARIA-LANE.

1823.

LONDON
PRINTED BY COX AND BAYLIS, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.

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BOOK III.

ON

INVENTIONS

OF

MECHANIC ART.

COLLECTIONS

TOWARDS A HISTORY OF

ANCIENT CUSTOMS, INSTITUTIONS, AND INVENTIONS.

BOOK III.

AUTOMATA.

VARIOUS KINDS OF AUTOMATA;—MARIONNETTES;—PHALLI;—ANCIENT STATUES AND MOVING FIGURES;—ANDROIDES;—AUTOMATIC DUCK;—FLUTE-PLAYER;—CHESS-PLAYER:—AUTOMATIC OPERA;—SPEAKING FIGURES;—ORACLES OF THE ANCIENTS;—OMBRES CHINOISES;—FANTOCCINI.

THE various kinds of puppets usually termed *Marionnettes*, the *Ombres Chinoises*, and the *Androides*, are ingenious mechanical contrivances, which are usually ranked under the indiscriminate title of *Automata*, although it properly belongs only to those machines that are kept in motion by weights, springs, and wheels, and which are called Androides when they represent the human figure.

Of these, the *Marionnettes,* which are merely moved with strings, are the most ancient. They were common among the Greeks and Romans, and many of their authors speak of such figures,—termed by them *neurospasta,*—which they describe as moving their heads, eyes, and limbs, in a very natural manner. They were much used at their public shows; and among them may be ranked the *Phalli,* which were carried round the villages during the festivals of Bacchus and Osiris; as well as those other images, of a similar description, mentioned by Herodotus:—"*Festum Baccho Ægyptii celebrant, exceptis choris, fere per omnia eadem Græcis. Sed, loco phallorum, sunt ab eis excogitata aliæ statuæ circiter cubitales nervis mobiles, quas feminæ circumferunt per pagos, veretro nutante, quod non multo minus est cœtero corpore.*"

Whether the ancients were acquainted with any method of constructing *Automata,* or figures moved by springs, is a question not easily resolved. We have, indeed, the testimony of both Plato and Aristotle, that Dædalus was said to have made statues which had not only a locomotive power, but which it was necessary to tie down in order to prevent them from running away! But the authority on which this assertion rested is exposed to more than doubt; and was, probably, little else than the exaggerated expression of admiration at statuary approaching nearly to the resemblance of life. The latter author, indeed, mentions a moving image of Venus, formed of wood; but he expressly says, that the motion was communicated to it by means of quicksilver, though in what manner that was effected he does not describe. The account given by Aulus Gellius of a pigeon that was constructed by Archytas of Tarentum, about four hundred years before the Christian æra, is equally imperfect; we are informed that it flew, but nothing is said from which any conclusion can be drawn respecting its mechanism. As to the head, upon the construction of which, in the thirteenth century, the monk Albertus Magnus is said to have bestowed the labour of thirty years, all that is known respecting it is, that it is represented as having not only moved but spoken; and that Thomas Aquinas, terrified by its powers, and conceiving it to be formed by magic, broke it to pieces; which accident Albert bore with such philosophy, that he merely exclaimed, *periit opus triginta annorum!* At a still later period the well-known John Muller, or, as he is sometimes called, Regiomontanus,* made an iron fly, which is said to have flown about; and a wooden eagle, which flew to meet the Emperor Maximilian on his arrival at Nuremberg in 1470: but these pieces of mechanism are not mentioned by contemporary writers, nor are they described in the works of the supposed inventor.

The earliest, and certainly the most useful, invention that may be ranked amongst the Automata, of which we have any certain account, is that of clocks. When these were brought to perfection, some artists added figures to them, which performed various evolutions at the time of striking; and when this attempt had succeeded, others endeavoured to construct those single human images which appear to move without assistance, and to which we apply the name of *Androides*. So early as the middle of the sixteenth century, a locksmith at Nuremberg constructed figures of this description, some of which beat a drum, and others played on the lute in proper musical time; and we know that, about the same period, the Emperor Charles V. amused himself in his retirement with similar pieces of machinery. It is also mentioned by the author of a poem entitled "*Zodiacus vitæ,*" that he saw at Rome, in the beginning of the sixteenth century, during the pontificate of Leo the Tenth, a figure, which had been constructed by a potter, that played upon a wind instrument; but no account is given of its construction, and it is merely described as follows:—

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* "*Regiomontanus.*" Also mentioned in Book I., Art. *Almanacks*.

> "*Vidi ego dum Romæ decimo regnante Leone,*
> *Essem, opus à figulo factum, juvenisque figuram,*
> *Efflantem angusto validum ventum ores hiatu.*"

The first Androides that attracted attention in the last century, were those exhibited at Paris by the celebrated Vanconson, in 1738. They principally consisted of two figures; one representing a flute-player, which, as we are assured, played twelve tunes on a German flute, in the same manner as a living performer, while the other played on the shepherd's pipe, held in the left hand, and with the right beat upon the *tambour de basque*. There was also an automatic duck, of the natural size and plumage, which exhibited the usual movements of the animal, uttered the same sounds, ate and drank, and then voided its food in an apparently masticated state: the motion was communicated by means of a cylinder and slender chains, similar to those of a watch. But this figure cannot be considered as an original invention; for Labat tells us,* that the French General de Gennes, who in 1688 defended the island of St. Christopher against the English, had constructed a peacock, which performed similar movements. Of the flute-player, there is a minute description in the Memoirs of the Royal Academy of Sciences at Paris, which is too curious to be omitted.

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* "*Labat.*" *Nouveau Voyage aux Isles de l'Amérique*, 4to. vol. ii.

"The figure," we are told, "was about five feet and a half high, and was placed upon a square pedestal, which concealed a portion of the machinery. The air entered the body by three separate pipes, into which it was conveyed by nine pairs of bellows, which expanded and contracted in regular succession by means of a steel axis turned by clock-work. These bellows performed their functions without any noise, which might have discovered the means of conveying the air into the machine. The three tubes that received the air from the bellows passed into three small reservoirs in the trunk of the figure, where they united, and, ascending towards the throat, formed the cavity of the mouth, which terminated in two small lips. Within this cavity was a small moveable tongue, which, by its motion at proper intervals, admitted the air, or intercepted it in its passage to the flute. The fingers, lips, and tongue, derived their appropriate movements from a steel cylinder, also turned by clock-works. It was divided into fifteen equal parts, which, by means of pegs pressing upon the ends of fifteen different levers, caused the other extremities to ascend. Seven of these levers directed the fingers, having wires and chains fixed to their ascending extremities, which, being attached to the fingers, caused them to ascend in proportion as the other extremity was pressed down by the motion of the cylinder, and *vice versâ*: then the ascent or descent of one end of a lever produced a similar ascent or descent in the corresponding fingers, by which one of the holes of the flute was occasionally opened or stopped, as it might have been by a living performer. Three of the levers served to regulate the ingress of the air, being so contrived as to open and shut the three reservoirs abovementioned, by means of valves, so that more or less strength might be given, and a higher or lower note produced. The lips were directed by four levers, one of which opened them to give the air a freer passage; the other contracted them; the third drew them backward; and the fourth pushed them forward: the lips were projected upon that part of the flute which received the air, and by the different motions already mentioned, properly modified the tune. The remaining lever was employed in the direction of the tongue, which it easily moved, so as to open or shut the mouth of the flute. The just succession of the several motions performed by the various parts of the machine, was regulated by the following simple contrivance:—the extremity of the axis of the cylinder terminated on the right side by an endless screw, consisting of twelve threads, each placed at the distance of an eighth of an inch from the other. Above this screw was fixed a piece of copper, and in it a steel pivot, which, falling in between the threads of the screw, obliged the cylinder to follow those threads, and thus, instead of turning directly round, it was continually pushed on one side. Hence, if a lever was moved by a peg placed on the cylinder, in any one revolution, it could not be moved by the same peg in the succeeding revolution, because the peg would be an eighth of an inch beyond it by the lateral motion of the cylinder. Thus, by an artificial disposition of these pegs in different parts of the cylinder, the statue was made by the successive elevation of the proper levers to exhibit all the different motions of a flute-player."

In the year 1752, one Du Moulin, a silversmith, travelled through Germany with similar Automata, which he sold at Nuremberg for three thousand florins, and afterwards went to Russia, where he constructed some curious machinery, and died at Moskow in 1765.

Some years after the exhibition of these Androides, the figure of a chess-player was shewn at Vienna, where it excited universal astonishment. It played with any bystander indifferently, made all the moves with the greatest accuracy, and displayed no small proficiency in the game; nor were there any visible means by which it might be directed, although it is certain that the mere power of machinery alone is insufficient to effect a movement that is not preconcerted. This machine was constructed at Presburgh by a gentleman named De Kempelen, who was director-general of the salt mines in Hungary. It represented a man of the natural size, dressed as a Turk, and seated before the table which held the chess-board. The inside of both the table and the figure was filled with wheels, springs, and levers, which were shewn without hesitation, and entirely removed the suspicion which had been generally entertained, that a boy was concealed within.* It raised the arm, advanced it towards that part of the board on which the piece stood which ought to be moved, and then, by a turn of the wrist, it brought the hand down, closed it upon the piece, and placed it on the square to which it was to be removed; after which it laid its arm on a cushion placed on the table. When it had to take any of the adversary's pieces, it removed them at once from off the chess-board, and then, by a series of such movements as we have described, returned the hand to its own piece, and placed it on the square which the other had left vacant. The late Mr. Dutens, who played with this figure in the year 1771, in the presence of the English Ambassador and many other persons of distinction, relates that he attempted to deceive it, by giving the queen the move of a knight; but his opponent immediately detected the imposition, took up the queen, and replaced her in the position from which she had been removed. The figure appeared to look carefully over the board at every move, and gave notice of a check to the king by shaking its head. The only apparent communication which Mr. De Kempelen held with it, consisted in his occasionally winding up the springs in the arm; but this, it will be observed, although it might renew the *moving force*, could not convey any *power of direction*: it is, nevertheless, certain that the figure could not play unless the director was near it. An automaton of the same ingenious construction, and another that played on the piano-forte, both of which were recently exhibited in London, must be in the recollection of many of our readers.

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* A treatise was afterwards published, entitled "The Chess-player Detected," in which the same assertion was repeated; but it was not answered by M. de K., and did not obtain much credit.

A very ingenious piece of mechanism was

also invented by Monsieur Truchet, of the French Academy of Sciences: it was a moving picture, in the space of only sixteen inches and a half broad by thirteen high, which represented an opera of five acts, with a change of decoration in each, and consisted of a vast number of figures of a very diminutive size, which expressed by their gestures all the requisite action of a pantomime.

Speaking figures are supposed to be as ancient as the oracles of Egypt and of Greece. When the idolatrous statues at Alexandria were demolished, in the fourth century, some were found that were hollow, and so disposed against the walls, that a priest could stand behind unperceived and speak through the mouth. It was in this manner, no doubt, that the head of Orpheus, in the isle of Lesbos, appeared to speak, and that the oracles were delivered from the sacred grove around the Temple of Jupiter at Dodona. But the pagan priests were too cautious to trust entirely to such means of deception, and, therefore, sometimes deemed it less liable to suspicion to confide their answers to women who pretended to the gift of inspiration. The oracle at Delphi, the most celebrated of antiquity, affords an instance of these means being jointly resorted to in the tripod and the Pythia. The same imposition was occasionally practised during the early ages of Christianity; but the images of the Saints have long been silent, and if ever their votaries heard a voice responsive to their prayers, the source from whence it came is no longer a mystery.

It is not known at what precise period these figures fell into the hands of lay jugglers; but we find that one of them excited great astonishment in this country in the reign of Charles the Second. It was exhibited by one Irson, an Englishman, and was visited by his Majesty and the whole Court, who were infinitely surprised at the pertinence of the answers it delivered to the various questions proposed, until a page discovered a person in an adjoining apartment, who was so placed as to hear what passed, and who replied through a pipe which communicated with the head of the image.

The *Ombres Chinoises* are, as the name indicates, a Chinese invention. They are small figures, of pasteboard, the joints of which are pliable, and put in motion by lines communicating with pegs which are fastened to them. The space within which these puppets move, and which is usually made to represent the stage of a small theatre, is covered with a fine curtain of gauze, and is illuminated towards the apartment in which the spectators are placed, by means of light reflected back from a mirror, so that the shadows of the pegs and the action of the lines are concealed. In this manner the images perform without any apparent assistance, and while a dialogue is recited behind the scenes, they are made to represent the appropriate action. Considerable dexterity is requisite to manage them with effect, and more than one person must be employed for each puppet that is to perform a variety of movements; but when this is conducted with skill, the illusion is truly surprising. There was, not many years ago, a theatre in London entirely devoted to this amusement, under the title of the *fantoccini.*

BELLOWS.

ANCIENT USE OF BELLOWS;—ILLUSTRATIONS;—SMELTING WORKS;—DESCRIPTION AND ADVANTAGES OF WOODEN BELLOWS;—INVENTION.

THE first instrument employed for blowing a fire was undoubtedly a hollow reed; but the art of imitating the action of the lungs, and supplying air by artificial means, was an early discovery, for our common bellows appear to have been known to the ancient Greeks. There is not, however, any passage in the authors of antiquity, from which information can be collected respecting the oldest construction of this machine; and this, however trivial the subject may appear, is to be regretted, as it would have contributed to enlarge the knowledge we possess of the metallurgy of the ancients.

In the following lines of the Georgics—

> —— "*Alii taurinis follibus auras*
> *Accipiunt, redduntque.*"*

we find a very plain allusion to bellows; and Virgil is not the only author who employs the expression "*folles taurinos,*" for Plautus also says, "*quam folles taurini habent, cum liquescunt petræ, ferrum ubi fit.*"†

Strabo tells us, on the authority of an old historian, that Anacharsis, the Scythian philosopher, invented the bellows, the anchor, and the potter's wheel; but this seems doubtful, as Pliny, Seneca, Diogenes Laertius, and Suidas, only attribute the two last to him; and Strabo also remarks, that the potter's wheel is mentioned by Homer, who lived prior to the time of Anacharsis. It is therefore probable that the latter became acquainted with it on his travels, and having made it known to his countrymen, was looked upon as the inventor.

Before the modern improvements in

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[*] Georg. lib. iv. l. 171.

[†] Plaut. in Fragmentis.

machinery, the bellows used in smelting-houses were worked by men; and this accounts for the remains of metallic substances being found in places destitute of water. The invention of the steam engine has, however, occasioned the restoration of some ancient works, which had been abandoned in consequence of the want of a stream of sufficient power to put the requisite apparatus in motion.

Bellows made with wood and leather are attended with many inconveniences, which are partly obviated by the use of wood alone. It is difficult to describe these bellows without the aid of an explanatory figure; but some idea may be formed of them from the following sketch.

The entire machine is composed of two boxes placed over each other, the uppermost of which can be moved up and down in the manner of a lid with a hinge; but the sides of the upper box are sufficiently large to contain the lower between them, when raised to its greatest extent. Both are fastened together at the smallest extremity, where the pipe is inserted, by a strong iron bolt. It will be readily comprehended, that when the boxes fit each other with exactness, and the upper is raised over the under, which is immoveable, the space contained within both will be increased: consequently that more air will rush in through the valve in the bottom of the lower one; and that, when the upper box is again pressed down, this air will be expelled forcibly through the pipe. The only difficulty is to prevent any portion of the air from escaping at any other part of the machine than the orifice of the pipe; and this is obviated by the simple contrivance of placing moveable slips of wood on the inner sides of the uppermost box, which by means of metal springs are pressed to the sides of the lower box and fill up the intervening space.

The advantages of these bellows over those commonly used, consist in their greater duration, and in the effect produced by them being both stronger and more uniform. The invention belongs to Germany. So early as the middle of the sixteenth century, an artist, named Hans Lobsinger, gave to the Magistrates of Nuremberg a catalogue of his machines, from the description of some of which it has been conjectured, that he was acquainted with the art of making such machines. But if that supposition be correct, it is also certain that the art died with him; and the earliest account to be relied on, ascribes the discovery to Martin and Nicholas Schelhorn, millers, who resided, about the year 1630, at the village of Schmalebuche, in the principality of Cobourg, in Franconia. Another account, indeed, assigns the invention to a Bishop of Bamberg; but it is unsupported by evidence; and a third, which is not devoid of probability, ascribes it to one Lewis Pfauneuschmidt, who, it is said, made such bellows for the smelting-houses in the forest of Harz, about the year 1621. In consequence of this the other bellows-makers conspired against him, and swore they would put him to death; but he was protected by the Government, and his family long enjoyed the monopoly of making bellows for all the works in the forest.

CANALS.

CANALS OF THE EGYPTIANS;—IMPERIAL CANAL OF CHINA;—CANAL BETWEEN THE DON AND THE VOLGA;—CANAL OF TROLHAETTA;—DUTCH, FRENCH, AND SPANISH CANALS;—ENGLISH CANALS;—NEW RIVER;—DUKE OF BRIDGEWATER'S CANAL;—REGENT'S CANAL;—LOCKS;—NEW INVENTION.

THE advantages of Canals are so obvious, that we find them in use among the most ancient nations of the world. The Egyptians connected the Mediterranean and Red Seas by a channel across the isthmus of Suez, while other canals united Alexandria, Canopus, and the most important cities of their country. The Roman emperors also attempted to divide the narrow neck that united the district of Peloponesus to the continent.

But the artificial navigations of the Egyptians, the Greeks, and the Romans, shrink into apparent insignificance, when compared with the mighty works of the laborious and persevering Chinese. This extraordinary people conducted these almost interminable canals from the most remote quarters of their vast empire, until every town, nay, almost every village not immediately on the coast, had been visited in their turn. The imperial canal is one of the most magnificent monuments of human industry. Its extent, from Canton to the northern boundary of the empire, is nine hundred miles; the breadth fifty, and, the depth nine, feet; and consequently, it is navigable by vessels of considerable burthen, some of which use sails and oars, while others are towed. This immense canal passes forty-one cities, and a vast number of branches extend their minor ramifications to every river, every lake, and every navigable stream in their vicinity.

The canals have greatly contributed to produce and maintain the flourishing condition of China, and we learn from the concurrent testimony of historians and travellers, that the whole country may be traversed by water, except in the single instance of an impervious mountain. Canals are, indeed, the highways of China.

Other parts of Asia, however, are not without the benefit of those aquatic communications; and we are informed by our illustrious countryman, Major Rennell, that Hindoostan enjoys these advantages in no inconsiderable degree.

But, quitting the remote empires of the Eastern world, let us turn our eyes towards Europe. Here we shall learn that the great Peter, of Russia, conceived and prosecuted the mighty projects of uniting Persia with the Baltic, and the Don with the Volga. These stupendous works were impeded by the death of the monarch; but such has been the energetic perseverance of his successors, that a communication by water, four thousand five hundred miles in extent, has been completed, from St. Petersburgh to Astracan, with the single intervention of an impassable line of sixty miles in extent.

In Sweden, too, the canal of Trolhäetta will, when completed, unite the Baltic with the German Ocean; while Denmark has also been directing her active inquiries towards the same objects.

In Holland, a country as it were conquered from the dominion of the ocean, canals are numerous. Every province is intersected with navigable cuts, which, as in China, are used as roads. Nor do their communications terminate on the confines of the country, but, extending themselves into the contiguous parts of Germany, Flanders, and France, combine the double benefits of domestic and foreign commerce. The annual revenue of these canals has been estimated, by our ingenious countryman, Mr. Phillips, at the sum of £625 per mile.

Neither is France without canals; those of Burgundy, Orleans, the canal of Bourbon, and some others, are extensive; while that of Languedoc, forming a communication between the Mediterranean and the Atlantic Ocean, is celebrated among the grandest examples of human genius, and reflects equal honor upon the minister (Colbert) who patronized it, and on the engineer (Riquet) who conducted the works. The breadth is one hundred and forty-four feet, including the towing path; the depth six feet; the length sixty-four French leagues, and the highest part is six hundred feet above the level of the sea.

The canal of Arragon, in Spain, was commenced in 1781, but is yet incomplete. It is intended to facilitate the communication between the most flourishing parts of the kingdom; but the political state of the country precludes all hope of its immediate accomplishment.

Turning to our own country, we find the early vestiges of a Roman or Danish work, called Caerdyke, between the Nen, near Peterborough, and the Witham, near Lincoln. The extent is about forty miles, but it is now nearly filled with earth. This small cut is the only *ancient* artificial navigation of which any remains are extant; and it would seem, although in our time the English canals are quite unrivalled, yet that almost all the prodigious artificial navigations which have so vastly tended to aggrandize the British empire, have been begun and finished in the limited period of fifty years.

The canal commonly called the New River, was projected about the year 1608, by Edward Wright, author of an excellent treatise on navigation, but was completed by Mr. (afterwards Sir Hugh) Middleton. The commencement is at Ware, in Hertfordshire, and the termination at what is called the New River Head, at Islington. Although the actual distance between Ware and Islington does not exceed twenty, this canal takes a circuitous route of sixty miles. In some places it is thirty feet deep, but its most remarkable feature is the circumstance of the whole being on one level. This canal is not used, nor was it ever intended, for navigable purposes, its only object being to supply the metropolis with water for domestic use.

After the completion of the New River, the disastrous circumstances which attended the pecuniary affairs of the proprietor deterred all future speculation of an analagous nature, until the late Duke of Bridgewater, about the middle of the last century, determined upon the construction of a canal, on a line of peculiar difficulty, by means of which some rich coal mines, then useless from the peculiarities of their location, would be rendered directly accessible to the flourishing towns of Manchester and Liverpool. Having surmounted innumerable difficulties, through the able assistance of the celebrated engineer, Brindley, the Duke of Bridgewater's canal was at length completed, and the nation universally acknowledged that the scheme—which had been originally slighted and discouraged—was calculated to reward its noble projector, not alone with fame, but with the more substantial benefits of wealth.

After the successful completion of this canal, innumerable others were set on foot, and the number that have since that time been completed is so great, as to render it impossible, in a notice so limited as the present, to say more than that their total estimated length exceeds five thousand miles, and that the conveyance of merchandize by canals is now common to almost every part of the kingdom. The last work of this kind the Regent's Canal, extending from Paddington to Limehouse, and passing through a tunnel three-quarters of a mile in extent, under the brow of Islington.

The construction of canals is necessarily dependant on a variety of local circumstances: the peculiarities of the ground—the proximity and level of rivers—the size of the boats intended to be navigated—and the supply of water. Of these, the last is often attended with circumstances of particular inconvenience. A great loss of water is experienced from the passage of vessels through the locks, which are necessary at every rise or fall of the canal. These locks consist of parallel walls of masonry, at a distance from each other sufficient to admit the vessels which navigate the canals. Between them, at each extremity, is a pair of gates, which meet each other in the centre, and open, or close the communication with either level of the canal, as occasion may require. Thus, if a vessel be supposed in the upper level of a canal, which it is desired to transfer to a lower level, the gates of the lock towards the lower level must be closed; then, a sluice being opened in one, or both, of the gates contiguous to the upper level, the water rushes through the orifice, and the lock is presently filled. The vessel is now towed into the lock, and the upper gates being closed, a sluice in one, or both, of the lower gates is opened, and the water is discharged from the lock into the lower level of the canal. As the water subsides, the vessel, necessarily, descends with it, until the surface of the water in the lock is level with that of the lower level of the canal.

In transferring a vessel from a lower to a higher level, the operation is reversed; still, however, with the unavoidable loss of a quantity of water equal to the horizontal area of the lock, multiplied by the difference of the contiguous locks of the canal. In the locks of the Grand Junction and Regent's Canals, the quantity thus lost at every passage is about ten thousand cubic feet. To prevent this waste of water, a variety of ingenious mechanical contrivances, some of them of a very complicated nature, have been devised;

several of these have been tried, at an expense of many thousand pounds each, but every experiment has hitherto failed. We are, however, informed that Mr. Busby, a gentleman well known as an architect, has, at length, discovered a mode of operation, which, at a moderate expense, and without any mechanism whatever, may be applied to save, at least, four-sixths of the water now lost in lockage, and without any delay in the time of passing. We forbear to dilate on the particulars of this important discovery, as we learn that it will shortly become the subject of an application for a patent.

But we must not be understood as asserting that the waste by lockage is always the most important loss experienced by canals, because the losses from evaporation, soakage into the banks, and leakage at the lock-gates, must also be added. The loss from evaporation and soakage must uniformly depend upon the extent of surface, while those from lockage and leakage will be regulated by the quantum of traffic, and the number of falls in the canal. It consequently happens, in cuts of short extent, and carrying on a great trade, that the lockage water is, by far, the most important of its losses; while, on the other hand, in canals of great length and less extensive use, the inconveniences produced by evaporation and soakage greatly exceed all others taken collectively.

CLOCKS AND WATCHES.

WATER-CLOCKS;—HOUR GLASSES;—INVENTION OF MODERN CLOCKS;—ANCIENT CLOCKS, IN ENGLAND, AND IN FOREIGN COUNTRIES;—PENDULUM CLOCKS;—WATCHES;—ARCHBISHOP PARKER'S STAFF;—REPEATERS;—WATCH OF KING ROBERT BRUCE;—KITCHEN JACKS.

THE ancients were wholly ignorant of the art of constructing mechanical clocks. It was not, indeed, until late in the fifth century of the Roman æra that the first sundial was introduced into Rome; and although that was calculated for another meridian, and was, consequently, incorrect in its new situation, it, nevertheless, continued, for ninety-nine years, to be the only instrument by which time was regulated in that celebrated city. At a later period a machine was invented, at Alexandria, termed a *clep-*

sydra, or water-clock. This was, in fact, nothing more than a basin filled with water, which was emptied in a certain number of hours, through a hole in the bottom, into another vessel, in which it rose around a graduated scale of the hours: or, more simply still, a conical glass with the scale marked on the sides; and which, being perforated at the base, denoted the hour as the liquid subsided. But these, unartificial as they were, served the purpose of ascertaining the time with tolerable accuracy; and to them may be traced the origin of that still common instrument the hour-glass. Various improvements were occasionally made in them, of the ingenuity of which we may form some idea from the description that has been given of one sent as a present to Charlemagne, in 807, by the Caliph Haroun Alraschid, which is said to have contained the figures of twelve knights, who, guarding as many doors, opened and shut them according as the hours revolved, and struck the time upon a metal bell. This, indeed, has been considered as the origin of our modern clocks; but the manner in which it is mentioned in the *An-*

nales Francorum, clearly shows that it was merely a water-clock of uncommon construction. There is also a very ingenious modern machine, known under the name of a water-clock. It consists of a cylinder divided into small cells, and suspended by a thread fixed to the axis in a frame on which the hours are marked. As the water flows from one cell into another, it slowly changes the centre of gravity of the cylinder, and puts it into motion. It is supposed to have been invented in Italy, about the middle of the seventeenth century.

Both the period of the discovery and the name of the inventor of clocks moved by machinery, are uncertain. It has been ascribed to various persons, in Europe, even so early as the ninth century; but, after a minute investigation of their several claims, there seems little doubt that the instruments of which they were the contrivers, were nothing more than some improvement, such as that already mentioned, on the water-clock, and that the origin of the present invention is not older than the eleventh century. About that time, clocks moved by weights and wheels certainly began to be used in the monasteries of Europe. But still, it seems probable that we are indebted for them to the Saracens, from whom, indeed, in the early ages, all mathematical science appears to have emanated. They were at that period, no doubt, rude in their construction; and the numerous directions found in the ancient records of convents, for their regulation when out of order, would lead us to conclude that they must have been very imperfect in their operation. They pointed out the hour, indeed, by an index; and it also seems that they emitted a sound; but it does not clearly appear whether the latter is to be considered as a regular annunciation of the hours in progressive order, or only an occasional notice to the monks for the performance of their duties, according as the clock might be regulated, or struck, by the sacristan. The writers of the thirteenth century speak of them as being then well known; and they had become so common in the time of Chaucer, who died in 1400, that he alludes to them as a poetical simile for the crowing of a cock:—

> " Full sikerer was his crowing in his loge,
> As is a clock, or an Abbey orloge."*

The oldest clock of which there is any account, in this country, was erected in the year 1288, on a building called the clock-house, at Westminster. It was intended for the use of the courts of law, and it is a singular fact, that the expense was defrayed out of a fine imposed upon the chief justice of the King's Bench for altering a record of the court. It was considered of such value, that, in the reign of Henry VI., the care of it was entrusted to the Dean of St. Stephen's, with a salary of sixpence per day; and it was still existing in the time of Queen Elizabeth. The clock-house was standing so late as 1715, when it was pulled down to make room for the buildings in Palace-yard; and a memorial is still preserved on its site, of the former existence of the clock, in a dial, inserted in the second pediment of one of the houses opposite Westminster-hall, and on which is this remarkable motto: "*discite justitiam moniti;*" which appears clearly to relate to the circumstances of its erection. For the credit of the judge—Radulphus de Hengham—it must not, however, be omitted, that the alteration made by him in the record of his court was solely with a view to mitigate a penalty imposed on a poor defendant.

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* The word *orloge*, or *orologe*, was long used in this country synonimously with clock: and even at this day, the clock of the cathedral at Wells is called the *horologe*.

Mention is also made of a great clock for the cathedral of Canterbury, which was erected in the year 1292 at an expense of thirty pounds. The most ancient clock now existing in England is that of Hampton-court palace, the date of which is 1540.

Leland gives an account of an astronomical clock, also made in England, in the reign of Richard II., by Richard de Wallingford, who, from being the son of a smith, raised himself, by his learning and ingenuity, to the dignity of Abbot of St. Albans. It not only told the hours, but the position of the sun and the fixed stars, the course of the moon, and the rise and fall of the tide; and it appears that it continued to go in Leland's time, who was born in the latter part of the reign of Henry

VII.: it was called by the inventor by the quaint name of Albion, sc. *All-by-one.**

Clocks were, however, for a long time confined to monasteries; and it is remarkable, that the records of their general use, on the continent, are by no means of so early a date as that of those we have already described as publicly known in this country. The poet Dante, indeed, who was born in 1265, mentions them in the Paradiso; and his allusion is, plainly, to a clock which struck the hour:—

> "Indi come *horologio che ne chiami,*
> Nel hora che la sposa d' Idio surge,
> Amattinar lo sposo, perche l' ami."—*c. x.*

But the first public clock known to have been put up in Italy, was erected on a tower of the palace at Padua, early in the fourteenth century; that of Bologna was not fixed until 1356, nor that of Venice until 1497.

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* This Richard de Wallingford was the author of a large folio on astronomy, the original M S. of which is still preserved, to which he also gave the name of Albion; it is remarkable for being the oldest English manuscript in which Arabic figures are used instead of the Roman numerals: the date is 1326.

In Spain, the first clock of which we have any account was made for the cathedral of Seville, in 1400. In France, we read in Froissart's Chronicles, that in the year 1332, the Duke of Burgundy removed from Courtray to his capital at Dijon, a famous clock, which struck the hours; and which was so large, that it was carried on cars. The first great clock at Paris was erected on the palace in 1372. It was made by a German; and we may conclude from that fact, and from the circumstance of a protection being on record as granted, in the reign of Edward III., to three Dutchmen, to exercise the art of clock-making in England, that it flourished at an early period in Germany: there is not, however, any certain account of a public clock having been erected in that country before the year 1395, when one was put up at Spire, the works of which cost fifty-one florins.

The invention of *pendulum clocks* is due to the ingenuity of the seventeenth century; and the honor of the discovery is disputed between Galileo and Huygens. Becher contends, in his work *de nova temporis dimetendi* *theoria*, published in 1680, for Galileo; and relates, though at second-hand, the whole history of the invention; adding, that one Trefler, clockmaker to the father of the then Grand Duke of Tuscany, made the first pendulum clock, at Florence, under the direction of Galileo Galilei, and that a model of it was sent to Holland. The Academy del Cimento also expressly declared, that the application of the pendulum to the movement of a clock was first proposed by Galileo, and put in practice by his son Vincenzo Galileo in 1649. But, whoever may have been the inventor, it is certain that the discovery never flourished till it came into the hands of Huygens, who insists, that, if ever Galileo had entertained such an idea, he never brought it to perfection. The first pendulum clock made in England was constructed in the year 1662, by one Tromantil, a Dutchman.

Towards the close of the fifteenth century, clocks began to be used in private houses; and about the same time mention is first made of watches. It appears that they were originally formed in the shape of an egg, or at least of an oval, and that catgut supplied the place of a metal chain, whilst they were commonly of a smaller size than those used until of late years. Of the latter, proof is afforded by the will of Archbishop Parker, dated in April 1575, in which he bequeaths to the Bishop of Ely, his staff of Indian cane *with a watch in the top*. That some of them were repeaters, is also proved by the fact, that Charles XI. of France, having lost his watch in a crowd, the thief was detected by its striking; yet the art of making these must have been afterwards lost, for we find it mentioned as an improvement in the reign of Charles II., and a patent was obtained for it in that of James II.

The oldest watch known in this country is that which was lately in Sir Ashton Lever's Museum: the date is 1541; but another is mentioned, in Derham's Artificial Clock-maker, published in 1714, which was said to have belonged to King Henry VIII., and was, therefore, probably earlier: it is a singular fact, that it was still in order when Derham wrote. Instances might be multiplied, to show that watches were known at the early period we have mentioned; but they do not appear to have been in general use until about the time of Queen Elizabeth.

The chief part of this summary has been extracted from a memoir of the Honourable Daines Barrington, which excited considerable interest; and we cannot dismiss the subject without giving, in his own words, the account of a watch which, from the celebrity it acquired, at last found its way into the possession of his late Majesty.

"I shall now adduce proof that not only clocks but watches were made in the beginning of the fourteenth century. Seven or eight years ago, some labourers were employed at Bruce Castle, in Fifeshire, where they found a watch, together with some coins, which they disposed of to a shopkeeper in St. Andrew's, who sent the watch to his brother in London, as a curious piece of antiquity. The outer case is of silver, in rather a handsome pattern, upon a ground of blue enamel; and I think I can distinguish a cipher of R. B. at each corner of the enchased work. On the dial-plate is written, *Robertus B. Rex Scotorum*, and over it is a convex transparent horn, instead of the glasses which we use at present. Now *Robertus* B. Rex Scotorum, can be no other king of Scotland than *Robert Bruce*, who began his reign in 1305, and died in 1328; for the Christian name of Baliol, who succeeded him, was Edward: nor can *Robertus B.* be applied to any later Scottish king. This very singular watch is not larger than those which are now in common use; at which I was much surprised, until I had seen several of the sixteenth century in the collections of Sir Ashton Lever and Mr. Ingham Forster, which were considerably smaller."

It may be imagined what a sensation the discovery of this curious relic created in the antiquarian world; what conjectures it gave rise to, and what doubts it terminated respecting the state of the arts in the fourteenth century. But alas! for the antiquaries; within a few years after its authenticity had been established by Mr. Barrington, there appeared, in the Gentleman's Magazine, a letter addressed to the editor, signed John Jameison, and dated Forfar, 20th August 1785, to the following effect:—

" You will remember that I formerly mentioned something to you in reference to the observations made by the Honorable Daines Barrington, on the earliest introduction of clocks—published in the Annual Register for 1779, under the article Antiquities. According to your desire, I will communicate what circumstances come within my personal knowledge, about a watch that corresponds very much to one described by him as being once the property of King Robert Bruce. But I must be indulged in some particulars to which I cannot speak with absolute certainty, as so much time hath elapsed since the transaction I am going to relate.

"Being early fond of any thing ancient or uncommon, I used to purchase pieces of old coin from a goldsmith who wrought privately in Glasgow, and sometimes went about as a hawker. Having often asked him, from the curiosity of a boy, if he had ever been at the castle of Clackmannan, or heard of any antiquities being found there, he told me, that he had purchased from Mrs. Bruce—who is the only survivor of that ancient family in the direct line—an old watch, which was found in the castle, and had an inscription, bearing, that it belonged to King Robert Bruce. I immediately asked a sight of it; but he told me it was not at hand. He fixed a time for showing me this invaluable curiosity; but even then it could not be seen. My avidity produced many anxious calls, although by that time I began to suspect he meant to play upon me, especially as I did not think it altogether credible that Mrs. Bruce would sell such a relique of her family, if she had ever had it in her possession. At length I was favoured with a sight of it. The watch, as far as I can recollect, almost entirely answered the one described. It had a ground of blue enamel. It had a horn above the dial-plate instead of a glass. The inscription was on the plate: but whether it was *Robertus B.* or *Robertus Bruce*, I cannot remember. The watch was very small and neat, and ran only, to the best of my knowledge, little more than twelve hours: Mr. Barrington does not mention any thing about this circumstance. It is about twelve years since I saw it. Whether there be any castle in Fife, properly called Bruce Castle, I know not; but the castle of Clackmannan hath always been the residence of the eldest branch of the family; and although the town in which it stands now gives name to a small county, yet in former times, and still in common language, that whole district receives the name of Fife, as distinguishing it from the county on the other side of the Firths of Forth and Tay. The first thing that occurred to me about the watch itself, was in regard to the inscription. Observing that all the coins of King Robert's age bore Saxon characters, I could not believe the inscription to be genuine, because the characters were not properly Saxon, but a kind of rugged Roman, or rather Italic characters, like those commonly engraved, but evidently done very coarsely to favour the imposition. He valued it at thirty shillings; but I would have nothing to do with it. The first time I had an opportunity of seeing Mrs. Bruce of Clackmannan, after this, I asked her if such a watch had ever been found. She told me, that she never so much as heard of any such thing. This confirmed the justness of my suspicion.

"I paid no further regard to this storv till about seven years ago, when I received a letter from a friend, informing me that a brother of his in London, who had a taste for antiquity, had desired him, if possible, to procure some intelligence from Glasgow about a watch, said to be King Robert Bruce's, which had thence found its way to London, and was there making a great noise among the antiquaries. I then applied to my former goldsmith, who was then in a more respectable way, and mentioned the old story. He immediately fell a laughing, and told me, that he did it merely for a piece of diversion, and thought the story would take with me, as I had been often asking about the place. He said it was an old watch brought from America; that, to get some sport with my credulity, he had engraved the inscription on it in a rough, antiquated-like form; that he had afterwards sold it for two guineas: he had learned that it was next sold for five, and had never heard more of it.

"However early the invention of clocks might be, I am greatly mistaken if any authentic documents can be produced of the art of making pocket-watches being discovered so early as the fourteenth century. Lord Kaimes, somewhere in his sketches of man, asserts, that the first watch was made in Germany, so far as I can remember, near the close of the fifteenth. If any watch had been made so early as R. Bruce's time, it is most likely the inscription would have been in Saxon characters, as not only the money both of Scotland and England, but of Germany, in that age, bears a character either Saxon, or greatly resembling it."

The mechanism of that common piece of household furniture, the kitchen jack, approaches so nearly to that of a clock, that it may without impropriety be mentioned under the same head. We have no account of the exact period of its first invention; but Montaigne mentions his having seen one at Brixen, in the Tyrol, in 1580, and describes it as a new discovery. He tells us, that it was kept in motion by a weight, in the same manner as clocks, and that when wound up it turned the spit for a whole hour. He had previously seen, in some other place, another, turned by smoke; and it would appear that the latter is the older of the two: for in a very scarce book on culinary subjects, published in 1571, by Bartolomeo Scappi, cook to Pope Pius V., there is a description, accompanied with an engraving, of the smoke-jack; but no mention whatever of a jack moved by weights.

CORN-MILLS.

ANCIENT MODE OF GRINDING;—WATER-MILLS;—TIDE-MILLS;—IMPROVEMENT IN THE ART OF GRINDING;—EXPERIMENTS ON THE PRODUCE OF WHEAT;—MILL-STONES.

In the remote ages of antiquity, corn was rather pounded than ground; and the hand-mills of which we read in the Scriptures were, probably, not very different from the pestle and mortar still in use. They required so little strength in management, that grinding was then the occupation of women; but afterwards, when they were enlarged, and improved by the addition of a cross-handle to the pestle, by means of which it was turned, they were worked by bondsmen, around whose necks was fixed a piece of wood, so constructed as to prevent them from putting their hands to their mouths, and consequently from eating the meal.

In process of time, shafts were added to these machines, and they were driven by cattle. In the opinion of Beckmann, the oldest cattle-mills resembled that described in Sonnerat's voyage to the East-Indies, in which the pestle of a mortar, fastened to a stake driven into the earth, is affixed to a shaft, to which two oxen are yoked: they are driven by a man, and another stands near the mortar to put the grain under the pestle.

There are various passages in ancient authors in which hand and cattle-mills are spoken of, which it would be uninteresting to detail: but it appears from them, that the first certain information we have of the invention of *water-mills*, is not older than the time of Julius Cæsar; and that, the first of these was erected on the Tiber, a short time previous to the reign of the Emperor Augustus. Cattle-mills, however, continued in such general use, that near three centuries afterwards there were more than three hundred at Rome; many of which were driven by asses. The first mention of *public* water-mills which occurs in the Roman laws, dates in the year 398, when some enactments were made, which show that they were even then considered as a new establishment.

These mills were situated on the aqueducts which supplied Rome with water; and as these were cut off when the city was besieged by the Goths in 536, Belisarius, who commanded the garrison, caused boats to be moored in the Tiber, on which he erected mills, which were driven by the current. To this experiment therefore, is to be attributed the origin of *tide-mills*.

It has been generally supposed that *wind-mills* were invented in the East, and introduced into Europe by the Crusaders: but this is so far from probable, that, even at the present day, mills of that kind are rarely found in either Persia, Palestine, or Arabia; and besides, wind-mills were in use on the Continent as early as the time of the first Crusade, and were common in the twelfth century. But these mills were for a long time constructed with an immoveable frame, and could only work when the wind was in one quarter. At present either the whole building turns on a pivot, or the roof alone with the axle-tree and sails are moved in the same manner, as the wind changes: an improvement which is attributed to either the Dutch or Germans, about the middle of the sixteenth century.

Among the many rights enjoyed by the feudal lords, was that of *ban-mills;* that is, of mills at which the vassals were obliged to grind their corn, for which they paid toll in kind. The oldest mention of these occurs in the eleventh century. We must not, however, attribute the exercise of this right wholely to oppression: the building of mills was always expensive, and was then considered as an undertaking of such magnitude, that those who erected them stipulated with the neighbourhood for the exclusive privilege of grinding, as an indemnification; but it cannot be denied that it was often unjustly exacted, and it is to this day a subject of grievance on many parts of the Continent.

The protection which society demands for property, rendered it necessary that enactments should be framed to prevent such use of common streams as might impede their general utility: wherefore individuals were restrained from erecting water-mills until it should have been declared, upon proper investigation, that they were not injurious. But the cupidity of some governments converted this equitable regulation into a monopoly, and not only were these mills included among the Regalia, or rights of the crown, but these were extended over the air; of which the following whimsical instance is recorded in the Chronicles of the Monastery of Augustines, at Weindsheim, in the province of Overyssel.

The Monks, it seems, were desirous of erecting a wind-mill in the neighbourhood of Zwoll; but the lord of the soil opposed their intention, on the ground *that the wind in that district belonged to him!* Upon this the Monks had recourse to the Bishop of Utrecht, who decided, " in a great passion," that no one had power over the wind in his diocese, *but himself!* And he, accordingly, granted letters patent to the holy fathers.

An account of the construction and management of corn-mills is both foreign to the intention of this brief essay, and would afford but little of either instruction or entertainment to the generality of readers; but it is not unworthy of remark, that by the manner of grinding commonly adopted in France so late as the middle of the last century, more than half the corn was, if not actually wasted, at least unproductive of meal, and considered as refuse. In consequence of experiments made from 1764 to 1768, the present method was adopted, by which the Paris setier of about 4⅓ bushels Winchester measure, which before that time yielded only 80 to 90lbs. of flour, and 150 to 160 of bran, was made to produce 185, and afterwards even 195lbs. of fine flour. This improvement consisted in nothing more than first grinding the corn coarsely, and afterwards passing it several times through the mill, and through various sieves: it was, indeed, by no means a new invention, and was not unknown even in France, but the millers were prohibited under severe penalties from adopting it, from a mistaken notion that it was prejudicial to health. The extraordinary influence which it must have had upon political economy, is evinced by the fact, that previous to its adoption, the annual consumption of each male adult, was calculated at four to five setiers of wheat, and now at only two.

In England, from six and a quarter to six and a half bushels of wheat are supposed to produce the sack of fine flour of two hundred and eighty pounds, from which are made eighty-four quartern loaves of the assize weight of four pound five ounces.

In America, where the art of mealing is presumed to be carried to great perfection, the following experiments have been made, from which some idea may be formed of the difference of product in various qualities of wheat:—

Weight per bush.	Superfine flour.	Tail flour and middlings.	Ship stuff.	B. Stuff, Shorts & Bran.	Screening and loss.	Quality of the Grain.
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
59 5	38 5	3 68	2 5	13 1	1 72	White, clean.
59	40 28	3 65	2 12	12	1	Do. well cleaned.
56	35 81	5	1 85	7 86	5 48	Do. very clean.
60	38 7	3 6	1 61	8 52	7 57	Red, not well cleaned.
59 25	35 26	4 4	1 47	11 23	6 79	Do. mixed with cockle and light grains.

From experiments accurately made in the latter country, it has also been found that the finest flour, or even that reduced to an impalpable powder, makes the lightest as well as the best bread; which is contrary to a very generally received opinion in England.

It is also an interesting fact that, in one year, a ton of sand, at least, is supposed to be rubbed off from a pair of mill-stones; and this sand, being of the finest nature, passes through the sieves with the flour, and is consequently used along with it. Whence it has been calculated that, supposing each pair of stones to grind no more than four thousand four hundred bushels of wheat annually, and each individual to consume eight bushels, a man thus swallows about four pounds of pulverized stone every year.

COTTON MANUFACTURE.

ANCIENT USE OF COTTON CLOTH;—SERICA;—BOMBYCINA;—TRADE BETWEEN ROME AND INDIA;—COTTON MANUFACTURE IN MALTA;—AND IN EUROPE DURING THE MIDDLE AGES;—INDIAN LOOM;—THREAD WHEEL; SPINNING JENNY;—SIR RICHARD ARKWRIGHT'S IMPROVEMENTS;—MULE;—INCREASE OF THE COTTON MANUFACTURE IN ENGLAND;—IMPORTS OF COTTON DURING THE LAST HALF CENTURY.

COMMENTATORS on the writings of the ancients have generally supposed that the stuffs called by Latin authors *bombycina*, and *serica*, were composed of a mixture of silk and wool; and they seem to have considered the terms as indiscriminately denoting a similar substance. The texture of this, we learn, was so thin, that an old writer humorously says, in allusion to it:—

"Æquum est induere nuptam ventum textilem,
Palam prostare nudam in nebula linea!"

"A woven wind should married women wear,
And naked in a linen cloud appear!"

and Seneca mentions that he had seen ladies dressed in robes so transparent, that they scarcely concealed the charms they covered: *video sericas vestes—si vestes vocandæ sunt—in quibus nihil est quæ defendi corpus aut denique pudor possit: quibus sumptis mulier parum liquido nudam se non esse jurabit. Hæc ingenti summa ab ignotis etiam ad commercium gentibus accersuntur, ut matronæ nostræ ne adulteris quidem plus sui in cubiculo quam in publico ostendant.*

We find, indeed, nearly the same description in various passages, and Juvenal accuses even a learned judge of appearing thus dressed, upon the bench:—

——— "Lo! robes, which misbecome
A witness, deck the awful bench of Rome;
And Creticus, stern champion of the laws,
Gleams through the tissue of pellucid gauze!"
Sat. II.

His learned translator, Mr. Gifford, who has thus rendered the passage, observes, in commenting upon it, that the "*sericæ vestes* were what we call fine cottons, imported into Europe in Juvenal's time, as they were ages before, from India, through the country of the Seres, the modern Bochara. *Bombycinæ vestes*, on the contrary, were of silk, and from *Sinæ* (China), a region much more remote. It is not easy to say when the use of these vests was first introduced into Rome; no mention of them occurs during the times of the old republic, so that they probably crept in, with other luxuries, under the emperors."

Considering that there was a regular commercial intercourse established through the medium of Egypt between Rome and India, the chief mart of which was on the coast of Malabar, which has been ever celebrated as the greatest manufacturing district of the East, and that the art of weaving was practised there at the remotest period of which we have any account, it is by no means improbable that Mr. Gifford's conjecture as to the use of cotton cloth in Rome is correct; that respecting the part of the Eastern continent whence it was obtained is more liable to doubt, but it is strongly corroborated by some lines in the Georgics of Virgil, which seem evidently to allude to the cotton plant:—

> "*Quid nemora Æthiopum, molli canentia lanâ,*
> *Velleraque ut foliis depectant tenuia Seres.*"
>
> "Of Æthiop's hoary trees and woolly wood,
> Let others tell: and how the Seres spin
> Their fleecy forests in a slender twine."
>
> *Dryden, Georg. II.*

From the East the cotton plant found its way to the island of Malta, and its produce was manufactured there at a very early period. The island is celebrated for producing that species which is naturally of the Nankeen colour, and stuffs of considerable fineness are woven from it at the Citta Vecchia. There is also a considerable manufactory of light coverlids; but the chief trade consists in the export of cotton thread to Spain. Of the continuance of this manufactory after the subversion of the Roman Empire, and during what are termed the middle ages, there are no certain accounts; nor is it known that the cotton plant was cultivated during that æra in any part of Europe. The introduction of cotton in an unmanufacured state, for the purposes of weaving, is of comparatively modern date, and it is only within the last half century that it has become an object of importance in this country.

The original loom, which is still used in India, probably without alteration of the form in use during the earliest age of its invention, consists merely of two bamboo rollers, one for the warp, the other for the web, with a pair of geer, and the shuttle performs the double office of the batton. This simple apparatus the Indian weaver frequently erects under the shade of a tree. He digs a hole large enough to contain his legs, and the lower part of his geer; he then stretches the warp by fastening the rollers at due distance in the turf, and suspends the balances of the geer from the spreading branches of the tree; two loops beneath the geer, into which he inserts his great toes, serve instead of treddles; and with his long shuttle he both draws the weft, throws the warp, and afterwards closes it up to the web. In such primitive looms as this are made those admirable muslins, the softness and delicacy of which have not even yet been equalled by all the complicated improvements of European machinery. The spinning is still performed by the ancient operation of the distaff.

In England, where the cotton manufacture has been brought to greater perfection than in any other part of Europe, the spinning has been variously performed. The most simple method, and the only one in use during a long time, was by means of a well-known domestic machine, called the one-thread wheel; but as the demand for cotton cloth increased, other inventions were thought of for facilitating this operation. About seventy years ago, the first patent for a more easy and expeditious method of spinning cotton was obtained by a person of the name of Paul; but the undertaking did not prove successful. Some years after, various machines were constructed for the same purpose by different persons, but without effecting any very material improvement. At length, about the year 1767, Mr. James Hargrave, a weaver in the neighbourhood of Blackburn, in Lancashire, contrived a machine by which a great many threads could be spun at once, for which he obtained a patent under the name of the "spinning jenny:" it was worked by hand, and when brought to perfection, one person could spin with it at once eighty-four threads, and make, in the course of a day, one hundred hanks of eight hundred and forty yards each.

The next, and most important improvement in this branch of the manufacture was made by Mr.—afterwards Sir Richard—Arkwright, of Cromford, in Derbyshire. His first patent was obtained in 1769, and he afterwards, in 1775, obtained another: but one of these was afterwards set aside in consequence of some legal defect, and he had for a long time to contend against a series of unforeseen difficulties. He at length, however, succeeded in establishing the celebrated machine called the "mule," from being composed partly of the machinery used in the hand-jenny. It is worked entirely by machinery, and is now exclusively employed in the manufacture of cotton thread, or, as it is technically termed, twist.

Although the name of Sir Richard Arkwright is doubtless familiar to most of our readers, as the inventor of great improvements in the art of spinning cotton,* and they are probably aware that to his improvements the kingdom is chiefly indebted for the extensive manufactories which it now possesses, it will yet, we should presume, be interesting to many to have some data from which they may judge of the importance of this branch of national industry; we therefore annex a statement, in round numbers, of the average annual imports, for every ten years during that period:—

From 1771 to 1780 inclusive,		5,725,000 lbs.
1781	. 1790 . . .	18,200,000
1791	. 1800 . . .	32,000,000
1801	. 1810 . . .	70,000,000
1811	. 1820 . . .	105,000,000

The imports of the last five years of the above series exhibit a still more rapid increase, the annual average being 144,000,000 of pounds, and the annual consumption upwards of two and a half millions weekly. The above view presents a phenomenon not easily parallelled in the history of commerce, and shows what influence the exertions of a single individual may have on the welfare of nations.

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* For the origin of Sir Richard Arkwright's improvements, see vol. i. b. i. p. 171.

DIVING-BELL.

ANCIENT EMPLOYMENT OF DIVERS;—INVENTION OF THE DIVING-BELL; — SPANISH ARMADA; — PHIPPS' ADVENTURE;—DIVING-BELL OF DRS. HALLEY, SPALDING, TRIEWALD, AND SMEATON;—APPARATUS FOR WALKING UNDER WATER; —MACHINERY FOR RAISING PROPERTY FROM THE ABERGAVENNY EAST-INDIAMAN.

SWIMMING is at once so necessary and so attractive an exercise, that it naturally led to the practice of diving, and the habit of remaining under water for an unusual period was easily acquired. Professed divers were formerly kept in ships, to assist, as it would seem, in raising the anchors; and, by the laws of the Rhodians, they were allowed a salvage on goods which had been thrown overboard, proportioned to the depth from which they were raised. In war, they were employed to destroy the ships of the enemy; and the pearl fisheries in the Indies were conducted by divers, in the time of the Greeks and Romans, in the same manner as at the present day: these sometimes continued under water during a quarter of an hour, and instances are recorded of some who have remained still longer.

At a very early period, means were contrived to supply divers with air while under the water; and with this view the diving-bell was invented. The idea which led to it was probably suggested by the following simple experiment: if an inverted drinking-glass be immersed in water, with the precaution to keep its edges on a level with the surface, the glass will not become filled with water, although pressed down to the greatest depth, because the air cannot be expelled by it. In the same manner, if a bell of metal be so constructed as that the diver can stand on a plank suspended below it, the upper part of his body, being enclosed by the bell, will be protected from the water; and, even at the bottom of the ocean, he may breathe the air confined within the cavity.

The invention of this machine is usually attributed to the sixteenth century. Aristotle, indeed, makes some allusion to a kind of kettle used in his time to enable divers to continue under water; but it is not described. The oldest information which can be relied upon respecting its actual employment, is the account of an experiment tried at Toledo, in the year 1538, before the Emperor Charles V. and many thousand spectators, when two Greeks descended into the water in a very large inverted kettle, in which there was also a candle burning, and rose again without being wetted. The kettle was equipoised with lead at the mouth, so that, when let down, no part of its circumference should touch the water sooner than another.

From this time the use of the diving-bell seems to have been well understood, and it is frequently mentioned in the works of Sir Francis Bacon. It was made use of about the middle of the seventeenth century, to assist in raising the treasure which was supposed to have been sunk in that part of the celebrated Spanish Armada which was wrecked on the western coast of Scotland, in 1588; but some cannon only were obtained, which were not sufficient to defray the expenses. The same experiment was repeated, in 1688, by a company, at the head of which was the Earl of Argyle, but it was attended with very little success. Previously to this last, it had been tried on the wreck of a rich Spanish vessel which had been sunk on the coast of Hispaniola, and the circumstances attending the undertaking are sufficiently curious to merit detail.

The loss of this ship, which was known to contain a vast treasure, induced one William Phipps, who was the son of a blacksmith, in America, and had been himself bred up as a ship carpenter, at Boston, to propose a plan to King Charles II. for raising the bullion with which she was freighted. The monarch, little scrupulous in such matters, approved the project, and furnished Phipps with a vessel and every thing necessary for the undertaking. He sailed on this expedition in 1683, but after various ineffectual efforts, he returned to England in great poverty, but still with a firm persuasion of the practicability of his scheme. But failing in his endeavours to prevail on King James II., who had then succeeded to the throne, to assist in its further prosecution, he had recourse to a public subscription, which, after considerable difficulty, he obtained through the aid of the Duke of Albemarle, who himself advanced a large sum towards it, and on condition of dividing the profits with the subscribers. In 1687 he once more set out to try his fortune, in a ship of two hundred tons; and after being reduced almost to despair by repeated fruitless trials, and just as he was on the point of abandoning the enterprize, he at length succeeded in raising, from a depth of between six and seven fathoms, such a quantity of the treasure, as produced in England, two hundred thousand pounds sterling. Of this sum his own share amounted to about twenty thousand pounds, and that of his patron the Duke of Albemarle to ninety thousand pounds. It further appears that some persons endeavoured to persuade the King to seize the ship and cargo, under pretence that Phipps had made some misrepresentation in his original plan; but his Majesty rejected the advice with indignation, and conferred on Phipps the honor of knighthood.

This machine has been used for similar purposes, at various subsequent periods, and numerous improvements have been made on the original invention, none of which, however, merit particular attention, except those of the late ingenious Dr. Halley, and of a Swede named Triewald.

The diving-bell constructed by order of Dr. Halley was three feet broad at the top, five at the bottom, and eight in height; forming a cavity of sixty-three cubic feet. It was covered with lead: around the mouth, weights were so arranged as that it could not remain in an oblique position, but must necessarily sink in a perpendicular direction; and it was so heavy, that it sank to the bottom even when empty. In the top, there was a piece of crystal glass to admit light, and a valve to allow of the escape of foul air. Around the interior circumference of the mouth, there was a seat for the divers, and a plank, secured by ropes, hung below, on which they could stand when at work. The entire machine was suspended from the yard of a ship, and could be lowered into the water, and hoisted up again, at pleasure. In order to supply it with fresh air while under water, vessels filled with air, and in which was an opening at the bottom through which the water compressed the enclosed air, were let down along with it. In the top of these was a leather pipe besmeared with oil, through which the air might be introduced into the bell; and so soon as one was emptied, it was drawn up, on a signal from the diver, and another was lowered. The corrupted air, in the bell, being, from its warmth, the lightest, escaped through the valve; and thus the machine was continually supplied with fresh air, in such quantity, that Halley and four other persons continued under water during an hour and a half, at the depth of ten fathoms, nor was there any limit to the period which they might have remained with equal safety. The sole inconvenience experienced was a pain in the ears, as if a quill had been thrust into them: the sensation was only momentary, but returned whenever the bell was let down to a greater depth. One of the divers, thinking to prevent this, filled his ears with chewed paper, but the air forced it into them so far that it was extracted with considerable difficulty.

With this apparatus Dr. Halley was enabled to keep out the water so effectually, that, at the bottom of the sea, the soil did not rise above his shoe. The glass in the top admitted so much light, when the sea was quite still, that he could read without difficulty; but in stormy weather, the rolling of the waves rendered the bell quite dark; he then kindled a light; but a candle consumed the same quantity of air as a man. He wrote his orders to those above with an iron spike upon a plate of lead, and sent them up when the air vessels were raised, by which means he directed the removal of the bell from one place to another. He also contrived a leaden cap which covered the entire head, and was supplied with air from a flexible pipe communicating with the bell, and with this he could send a diver several fathoms around it when at the bottom of the ocean. These contrivances were, however, liable to many objections; among the most serious of which were, the possibility of the bell being overset, by coming into contact with any unexpected obstruction below the water, and the danger of the rope by which it was suspended breaking before it could be drawn to the surface. These inconveniences were remedied by the ingenuity of Mr. Spalding, of Edinburgh, who added a balance weight, which, hanging a considerable way below the mouth of the bell, preserved its equilibrium in case of its meeting with any obstacle in its descent, and provided against accident by the failure of the rope in the following manner:—

The bell is divided into two separate cavities, both of which are made as tight as possible. Just above the second bottom, are small slits in the sides, through which the water, entering as the bell descends, displaces the air originally contained in its cavity, which flies out at the orifice of a cock contrived for that purpose. When this is done the divers stop the cock, so that if any more air was to get into the cavity, it could no longer escape as before. When this cavity is full of water the machine sinks; but when a considerable quantity of air is admitted, it rises. If, therefore, the divers wish to raise themselves, they turn another cock, by which a communication is made between the upper and the under cavities of the bell. The consequence of this is, that the air immediately rushes into the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is displaced. Thus, if a certain quantity of air be admitted into the upper cavity, the bell will descend very slowly; or if a greater quantity, it will remain stationary; and if a still larger quantity, it will rise to the surface: and thus the divers can raise the machine at their pleasure, and be still safe, although the rope to which it was appended should be broken.

The improvement of Triewald consisted in little more than placing the diver in such a position that his head alone rose above the surface of the water within the bell; which situation has the advantage of the air being cooler, and, consequently, fitter for respiration than at the upper part of the machine: and in some minute, and rather complex, arrangement of the air-pipe.

The late ingenious Mr. Smeaton's diving-bell was a square chest of cast-iron, four feet and a half in height, and in length, and three feet wide; affording room for two men to work in it. It was supplied with fresh air by means of a forcing pump, and was used with great success.

Although not strictly a diving-bell, it must not be omitted, that an Englishman invented an apparatus of very strong leather, so prepared, as that air could not escape through it, and so constructed, as to fit the limbs while it covered the entire body, and yet, having a glass in front, did not obstruct the sight. It contained half a hogshead of air, which afforded a supply for a considerable length of time; and when thus equipped, he could not only walk at the bottom of the sea, but enter into the various parts of a sunken ship. He is said to have followed this occupation for more than forty years, and to have acquired a considerable fortune.

The machinery contrived to raise property from the Abergavenny East-Indiaman, which was sunk a few years ago near Weymouth, consisted of a body of copper with iron boots and joints, as in a coat of mail. The whole was then covered with leather, and afterwards with canvas painted white to distinguish it in the water. The arms were made of strong water-proof leather, and the aperture for sight was about eight inches in diameter, glazed with crystal glass an inch thick. The diver was sunk by means of weights fastened equatorially round the waist of the machine, and he was suspended by a rope with which his situation could be changed at pleasure.

FIRE-ARMS.

EARLIEST USE OF ARTILLERY;—EXTRAORDINARY CANNON OF MAHOMET II.;—TURKISH HOWITZERS;—INVENTION OF MUSKETS;—FIRE-LOCKS;—AURUM FULMINANS;—PISTOLS.

It is a generally received opinion, that artillery was used by Edward III. at the battle of Crecy; but if so, it is a singular circumstance that Froissart, a contemporary historian, should have omitted to notice a fact of so much novelty and importance. We have, however, the decisive testimony of a passage in the works of Petrarch—who execrates this terrestrial thunder—that they were common before the year 1344: "*nuper rara, nunc communis.*"

The most extraordinary cannon of which there is any account in history, both for its size and the period when it was employed, was used by the Sultan Mahomet II. at the siege of Constantinople, in 1453. It was cast at the foundry of Adrianople, by a Dane or Hungarian, of the name of Urban, who had deserted from the service of the Greek Emperor Constantine Palæologus; and is thus described by Gibbon: "At the end of three months, a piece of brass ordnance was produced, of stupendous, and almost incredible magnitude; a measure of twelve palms is assigned to the bore; and the stone bullet weighed above six hundred pounds. A vacant place before the palace was chosen for the first experiment; but, to prevent the sudden and mischievous effects of astonishment and fear, a proclamation was issued, that the cannon would be discharged the ensuing day. The explosion was felt or heard in a circuit of an hundred furlongs; the ball, by the force of gunpowder, was driven above a mile; and on the spot where it fell, it buried itself a fathom deep in the ground. For the conveyance of this destructive engine, a frame or carriage of thirty waggons was linked together, and drawn along by a team of sixty oxen: two hundred men on both sides were stationed to poise and support the rolling weight; two hundred and fifty workmen marched before to smooth the way, and repair the bridges; and near two months were employed in a laborious journey of one hundred and fifty miles."

Voltaire, indeed, has ridiculed the credulity of the Greeks, in recording the account of this tremendous gun; and calculates, that a ball of only two hundred pounds would require a charge of one hundred and fifty pounds of powder, while the impetus received from it could be but feeble, since not a fifteenth part of the mass could be inflamed at the same moment. But the positive and unanimous evidence of contemporary writers is not to be lightly rejected; and we learn from the Memoirs of the Baron de Tott, that the Turks still possess a cannon still more enormous than that already described, from which a stone bullet of eleven hundred pounds weight was once discharged with three hundred and thirty pounds of powder: at the distance of six hundred yards it shivered into three fragments, traversed the strait of the Bosphorus, and leaving the waters in a foam, again rose and bounded against the opposite hill. It is, indeed, well known that the entrance of the Dardanelles is, at this moment, guarded by artillery of still greater calibre than that of Mahomet. These guns, if indeed they may be so called, are of that description termed howitzers: they are merely excavations in the solid rock, and as their elevation cannot, consequently, be altered, they are only of service against that particular point to which they remain unalterably directed; but the power of the shot, when it does take effect, is terrific, as was sensibly experienced by the British fleet on its attempt to force the passage during the late war.

The invention of portable fire-arms would appear to have originated in Germany, which, indeed, seems sufficiently proved by the circumstance that the old names by which the different kinds were distinguished, were all, either German, or immediately derived from that language. They were originally called *büchse*, and then *hakenbüchse*: whence the French took their *harcquebouzes*, which, in the modern dialect, we call *arquebuse*, and has also been adopted in the English *harquebuss.* These were the original musquet; but so long and heavy, that they could not be conveniently fired from the hand alone, and, therefore, when it was necessary to use them, they were placed on a prop, with a fork at the top, between which the piece was fixed by means of a hook projecting from the stock. They were first used at the siege of Parma, in 1521, and there is still one preserved, in perfect order, in the arsenal of Dresden; but the invention is, no doubt, of an earlier date, for it is supposed that gun-locks were invented in the city of Nuremburgh, in 1517.

The term musquet is said to have been taken from the Latin *muschetus,* an appellation for a species of the male sparrow-hawk; and this derivation is the more probable as the *falconet* and other arms were named after voracious animals. It has been proved that this arm was known in France so early as the reign of Francis I., although it has been asserted by Brantome, in his Memoirs, that it was first employed in the army of the Duke of Alva, in the Netherlands, in 1567.

He states, that there was at first great difficulty in accustoming the soldiers to its use; and he adds—what we may readily believe—that "*ces mousquets étonnèrent fort les Flammands, quand ils les sentirent sonner à leurs oreilles.*"

The first muskets were discharged by means of a match applied with the hand; but this was afterwards adjusted to a cock, for greater security and precision in shooting. Instead of the match, which was in many respects inconvenient, and subject to be extinguished, a fire-stone was, at a later period, screwed into the cock, and sparks were struck from it by means of a small wheel, which was wound up with a key applied to the barrel. The stone at first employed, however, was not flint as at present used, but a compact pyrites or marcasite, and, as this was apt to miss fire, the match continued for a long time to be used along with it, and flint-locks do not seem to have entirely superseded the match-lock in the Continental armies, until towards the close of the seventeenth century. We have already mentioned, that the first gun-lock was invented in 1517;

but there is no account of the form of its construction; and the old *büchse*, in the arsenal at Dresden, instead of a lock, has a cock with a flint placed opposite the touch-hole, which flint, it appears, was rubbed with a file until a spark was elicited: the term fire-lock was given to the invention which is still in use, and it was applied to the gun itself, in order to distinguish it from that which was fired by a match-lock.

An ingenious discovery has lately been made, by which the powder of *aurum fulminans** has been rendered applicable to the discharge of fire-arms. A cylinder has been contrived, which contains several cavities, and which revolves upon an axis fixed at right angles to the barrel; these cavities are filled with the powder, and each is brought successively opposite to the touch-hole by means of a key: the trigger, instead of moving a cock with a flint, impels a small peg which strikes upon the aurum fulminans, which, as it explodes by the mere force of percussion, instantly inflames the gunpowder in the barrel. The lock is thus secured from the effects of damp, and the piece is primed, at once, for several discharges.

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* "*Aurum fulminans.*"—See art. "Fulminating Powder." B.iv.

Pistols are first mentioned in France about the year 1544; but they are said to have been used at an earlier period in Germany, and were employed as an arm belonging to certain German cavalry, who were thence called *pistoliers*. The origin of the name, however, has not been ascertained: some have derived it, and with much appearance of probability, from *Pistoia* in Tuscany, where it is said they were first made; and others from *pistillo*, and *stiopo*, from the large knobs which terminated the handles. They seem to have been originally formed entirely of iron; and the locks were constructed with a wheel, in the manner already described. Several of these are preserved in ancient collections of arms: amongst those in the arsenal at Hanover, is one entirely of brass; and the date upon that considered as the most modern is 1606.

FIRE ENGINES.

INVENTION OF PUMPS;—CONJECTURES RESPECTING FIRE-ENGINES;—SIPHONES;—FIRES IN ANCIENT ROME.

The invention of pumps is ascribed, on the authority of Vitruvius, to Ctesibius, who lived at Alexandria in the time of Ptolemy Philadelphus and Ptolemy Evergetes, consequently about two centuries before the Christian æra. It seems probable, also, that he had conceived the idea of applying the principle to fire-engines, for his pupil, Hero of Alexandria, expressly mentions this use, and describes the construction of a forcing-pump with two cylinders. It is, however, doubtful whether this application of it soon became general, or indeed, whether it was known to the ancient Romans; but the following data are in favor of the probability that they were acquainted with some similar machine.

Among the letters from the younger Pliny to the Emperor Trajan, there is one in which he informs him that the town of Nicomedia, in his government of Bithynia, had been destroyed by fire ; and adds, that the conflagration had been spread by a violent storm which took place at the time, by the inertness of the inhabitants, *and by the want of proper instruments for extinguishing the flames.*[*] The word *sipho,* which is the term of which he makes use, can only be construed, in that passage, as meaning a fire-engine, though some commentators understand its general signification to mean only the aqueducts and pipes for distributing water throughout the city ; and Pliny also mentions buckets, which are usual appendages to that machine.

Apollodorus, the architect, who was contemporary with Pliny, and was employed by the Emperor Trajan in constructing the celebrated bridge over the Danube, and in erecting some large works at Rome, also describes how assistance may be rendered when the upper part of a house is on fire, *and the machine called sipho is not at hand.* In this case, he directs that hollow reeds are to be fastened to leathern bags filled with water, in such manner as that, by pressing the bags, the water may be forced through the reeds and projected to the place in flames; from which we may collect, that the *sipho,* for which this apparatus was a substitute, was capable of throwing water to a considerable height.

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[*] Plin. epist. lib. x. ep. 42.

That fire-engines, properly so called, were designated by the term *siphones* in the fourth century, is fully proved by the writings of Hesychius; and also by those of Isodorus, who lived in the seventh century. It still, however, remains to be proved at what period they were introduced into ancient Rome; and on this point no satisfactory data have been collected. It is well known that the buildings in that city were exceedingly lofty, and the lanes, and even the principal streets, extremely narrow; also that fires were frequent; and yet no mention is made in the Roman laws, among the numerous ordinances for preventing accidents by fire, of any machine for that purpose. Seneca says, that the height of the houses rendered it impossible to extinguish the flames when they were on fire; but Juvenal mentions, in his general description of a fire at Rome, that water was used for extinguishing it, and we can hardly suppose that he alluded to its being merely thrown with buckets:—

> "*Vivendum est illic, ubi nulla incendia, nulli*
> *Nocte metus: jam poscit aquam, jam frivola tranfert*
> *Ucalegon: tabulata tibi jam tertia fumant:*
> *Tu nescis.*"
>
> *Sat. III. v.* 181.

> "O! may I live where no such fears molest,
> No midnight fires burst on my hours of rest!
> For here 'tis terror all: midst the loud cry
> Of 'water! water!' the scared neighbours fly,
> With all their haste can seize. The flames aspire,
> And the third floor is wrapt in smoke and fire,
> While you unconscious doze."—*Gifford.*

GILDING.

ANCIENT MODE OF GILDING;—MOSAIC TABERNACLE;—MUMMIES;—ROMAN GOLD-LEAF;—GOLD-BEATER'S SKIN;—COURT-PLASTER; — DUCTIBILITY OF GOLD; — COLD GILDING; — FALSE-GILDING; — GILT PAPER AND TAPESTRY;—ALEXANDER THE IMPOSTOR;—PRIESTS OF BACCHUS.

THE extreme ductibility of gold induced people, at a very remote period, to attempt the reduction of it into thin plates, for the purpose of overlaying and ornamenting various articles. It is proved by Herodotus* that the Egyptians were accustomed thus to cover wood and metals; and Homer details the process employed for gilding, in this manner, the horns of a cow brought by Nestor, as a present to Minerva.† Gilding is also frequently mentioned in the Old Testament, more especially in the books regarding the construction of the Tabernacle. It is, however, uncertain whether the method thus employed is to be considered as that which we term gilding—merely with gold-leaf, or covering the substance to be ornamented with plates of gold. In deciding this point we have little beyond conjecture to guide us; but it has been justly remarked that, if plates had been used, the Mosaic Tabernacle would have been too heavy to be carried in the manner directed in the Scriptures, on the shoulders of men. Stronger arguments than this are, that the quantity of gold possessed by Moses does not appear, according to the best calculations that have been made of its supposed value, to have been sufficient for all the purposes for which it was employed, unless gilding alone had been resorted to;*

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* Herod., lib. ii. 63.

† Homeri Odyssea., lib. iii. v. 432.

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* "All the gold that was occupied for the work, in all the work of the holy place, even the gold of the offering, was twenty and nine talents, and seven hundred and thirty shekels, after the shekel of the Sanctuary." Exod. ch. xxxviii. v. 24. The highest valuation that has been made of this quantity does not exceed 300,000 ducats, or about £150,000 sterling.

and that, even the thinnest plates could not, without great difficulty, have been so fastened on the figures and carved work, as to exhibit them with the accuracy mentioned in the first book of Kings: "*and he carved thereon cherubims, and palm trees, and open flowers; and covered them with gold, fitted upon the carved work.*"* It may also be observed, that the Hebrews might perhaps have acquired the art of gilding in Egypt, where it seems to have been very early understood, for it is found on mummies, and in the very oldest temples; and although the antiquity of the former is doubtful, yet we find allusions to them in the Scriptures.† It also appears that, even in the time of Moses, there was some distinction made between gilding and overlaying with plates of gold; but it is not sufficiently clear to enable modern commentators to determine how far the difference extended.

In the time of the elder Pliny, in the middle of the first century of the Christian æra, the art of gold-beating was so well understood at Rome, that an ounce of that metal could be spread into seven hundred and fifty leaves, each of four inches square.* The account given by Pliny cannot, indeed, be relied upon for strict accuracy, but we know that it was beaten so thin that Lucretius compares it to a spider's web :—

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* Kings, ch. vi. v. 35.

† See the article *Museums*, b. 1. v. i. p. 208.

> Principio hoc dico, rerum simulacra vagari
> Multa modis multis in cunctas undique partes
> Tenuia, quæ facile inter se junguntur in auris
> Obira cum veniunt, ut aranea, bracteaque auri.
>
> *Lucretius, B.* 4. *v.* 728.

> First, then, observe, from all things round, escapes
> A numerous train of subtle, wand'ring shapes;
> Meeting in air, they freely blend and twine,
> Like filaments of gold, on spider's floating line.
>
> *Busby.*

It is, however, somewhat singular that, notwithstanding the frequent mention of leaf-gold in the writings of the ancients, there is no account of the instruments and apparatus used in forming it. But the German Monk Theophilus, who is by some supposed to have lived in the ninth, and by others in the twelfth, century, describes the process used in his time nearly as it is still practised; except that, he does not mention the flatting-mills which are now employed to reduce the ingots into plates; and that, the workmen covered the parchment, between which the gold was beat, with burnt ochre reduced to powder, to prevent its adhering to the cover, while modern gold-beaters make use of fine bolus.

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* Plin., lib xxxiii. ch. 3.

During the progress of this art, it was discovered that common parchment was too thick, and the skin of unborn calves was substituted for that of sheep. By means of this improvement, gold-leaf was beat far thinner than before; but it was only brought to its present perfection by employing that fine pellicle which is detached from the guts of oxen, and which is known, in its prepared state, under the name of *gold-beater's skin*. This discovery was made in the beginning of the last century; but was so long kept secret, that, even in England and Ireland, where it is better understood than on the Continent, it was, fifty years ago, only known to a few persons. It is a curious fact connected with this substance, that, in the beginning of the revolutionary war, the French entertained the idea of out-manœuvring the armies of their opponents by means of ærostatic machines; and, with that view, the Government circulated instructions for the preparation of this species of skin, which they call *baudruche*. As the process is curious in itself, and so minutely detailed in the instruction to which we have alluded, that some new information may perhaps be collected by those who are interested in the subject, we insert the document at full length:—

"On entend par la peau de baudruche une pellicule mince qui envelope le plus gros boyau du bœuf ou de la vache. Ce boyau est au milieu de la partie que l'on nomme fraise; il est long d'environ deux pieds et demi, placé au bout du boyau gras, et le seul sur lequel on puisse enlever la pellicule nominée Baudruche.

"Cette désignation est suffisante pour la faire distinguer, malgré la différence des noms qu'on lui donne. A Paris l'on appelle *Ratti* la partie du corps de l'animal où se trouve le boyau; ailleurs il se nomme *gros*. Le boyau lui-même porte différens noms, mais il est plus généralement connu sous celui de *Baudruche*.

" Voici la manière d'opérer: en tirant les entrailles du corps de l'animal, on partage la fraise d'avec la panse. C'est dans la première que se trouve la Baudruche. Il faut la détacher de la graisse avec beaucoup de précaution pour ne point l'écorcher ou la percer. On coupe ce gros boyau de la longueur de deux pieds et demi environ, à partir de l'extrémité de la poche qui forme le gros bout. Cette section se fait près d'un petit boyau qui traverse et qui partage ce qu'on appelle le boyau gras, ou gras boyau ; on fend ensuite légèrement, et dans toute sa longueur, du côté qui tenoit à la fraise, la pellicule mince qui enveloppe le boyau nommé Baudruche, et d'où elle a pris elle-même le nom de peau de Baudruche ; on la lève adroitement sans la déchirer. L'extraction finie, on la lève dans l'eau de rivière ou de pluie ; on a remarqué que l'eau de puits altéroit beaucoup les peaux de Baudruches, ce nettoyage enlève les ordures qui auroient pû s'y attacher ; il est essentiel de veiller à ce qu'elles ne soient pas traînées dans le sang, attendu qu'elles sont d'un naturel spongieux qui ôte la possibilité de les bien nettoyer lorsque une fois elles en sont imprégnées, elles sont dans cet état longues d'environ deux pieds et demi, et larges de huit pouces. Cette bande est extrêmement mince et transparente. Quand elle est bien lavée on la laisse se réunir dans sa largeur seulement, en lui conservant toute sa longueur. On la fait glisser doucement entre les doigts pour en exprimer l'eau ; elle présente alors la forme d'un cordon plus gros qu'un tuyeau de plume ; après cette préparation on doit la sécher.

" On suspend les peaux de Baudruches par leur extrêmité autour d'une ficelle, afin qu'elles ne touchent à rien, et que l'air puisse circuler librement autour. On les place dans un lieu sec et à l'ombre, à trois ou quatre pouces de distance les unes des autres.

"Lorsque le dessèchement est opéré, elles n'ont plus que la grosseur d'une paille de froment, et c'est alors qu'elles peuvent être employées."

When these skins have been worn out under the hammer of the gold-beater, they are commonly employed as adhesive plasters; and, notwithstanding the recentness of the modern discovery of the method of preparing them, it is certain that a similar substance was employed for the same purpose so far back as the middle of the twelfth century. This is proved by an anecdote in the life of the Greek Emperor John Comnenus; who, having wounded himself in the hand with a poisoned arrow, had the blood stanched by the application of a thin skin, which, from the description, must have closely resembled that in question.

Of late years, however, the use of gold-beater's skin, for surgical purposes, has been superseded by that of *court-plaster*, which is a composition of thin silk covered with isinglass and Peruvian balsam.

Early in the seventeenth century great astonishment was excited by the promulgation of the fact, that the Parisian gold-beaters could produce one thousand six hundred leaves, which together covered an area of one hundred and five square feet, from a single ounce of gold. But soon after the fine skin came into use, it was found that the same quantity could be extended so as to cover a surface of nearly one hundred and forty-seven square feet.

The art of gilding, especially unmetallic bodies, was greatly facilitated by the invention of oil painting; but it must be admitted that the process used by the ancients, in what is termed *cold gilding*, was nearly similar to that used at present. Pliny tells us, that the gold-leaf was applied to marble with a varnish, and to wood with a species of cement which he terms *leucophoron;* and that to metals it was affixed by means of quicksilver with the assistance of heat.* The metal was first prepared with salts, and rubbed with pumice-stone, and then heated; and this process is similar to that at present in use for gilding with amalgam, except that Pliny says nothing of evaporating the quicksilver by fire after the gold was laid on. That the art was anciently carried to great perfection is, indeed, proved by many existing remains. Among the ruins of some apartments of the Imperial palace on the Palatine hill, at Rome, there were discovered two rooms, on the walls of which the gilt ornaments were as fresh as if they had been newly applied; gilt statues have been also occasionally dug up in perfect preservation, although they must have lain many centuries in the earth; and some gilding is still preserved in the ruins of Persepolis.

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* Plin., lib. xxxiii. ch. 20 et 32.; lib. xxxv. ch. 17.

False gilding, that is, the art of applying thin leaves of silver, or of tin, to the substance to be gilded, and then rubbing them over with a yellow transparent colour, through which the metallic splendor appears, is very old; and a method of affixing a white metal to paper, and then covering it with a gold varnish, has been known in China from the earliest age of which there is any authentic record. It appears also to have been employed at a very remote period for gilding leather; of which many specimens may be found in ancient leathern tapestry.

Anderson says, in his History of Commerce, that it was introduced into England in 1633, but it seems to have been first attempted either at Messina or at Lucca, and to have been for a long time confined to Italy. But gilt leather was known so early as the time of Lucian, who conjectures that it was made use of by the impostor Alexander, whose thigh appeared to be of gold: "*ὁ μηρος αυτου χρυσους δίε φανη, δερματος, ως εικος, επίχρυσου περίτίθεντος;*" and Plutarch says that it was worn by the priests of Bacchus, during the celebration of his festival.

GLASS.

DISCOVERY OF GLASS;—MANUFACTURE IN TYRE, AND IN ROME;—GLASS-WINDOWS;—ANCIENT MANUFACTURE OF GLASS IN BRITAIN;—GLASS-ADDERS;—PROGRESS OF THE ART OF MAKING GLASS IN ENGLAND.

THE origin of the art of making glass, like that of many other valuable inventions, is probably due to chance. Pliny relates that it was first accidentally discovered, in Syria, by some travellers while dressing their food at the mouth of the river Belus. Being obliged to make a fire on the ground, where there was a great quantity of the herb kali, that plant burning to ashes, its salts incorporated with the sand, and thus became vitrified. The accident becoming known, the inhabitants of the neighbouring city of Sidon availed themselves of it, and soon brought the art into use. However the correctness of Pliny's account of the discovery may be questioned, it is certain that the most ancient glass-houses with which we are acquainted were erected in Tyre, which was for many ages the staple of that manufacture; and as it is scarcely possible to excite an intense fire, such as is frequently necessary in metallurgic operations, without vitrifying some part of the bricks or stones of which the furnace is composed, we may easily conceive how the hint of making glass may have been thus accidentally furnished.

The information to be collected from the writings of the ancients respecting the manufacture of glass, is extremely scanty. It is not supposed to have been made in Rome before the reign of Tiberius; at which period we are assured, by various authors, that an artist discovered the means of rendering it flexible; and, it is added, that he was put to death for his invention. Various utensils of glass have been found among the ruins of Herculaneum, which was destroyed in the first century of the Christian æra; but these were no doubt imported from the East; and although it has been conjectured, from the circumstance of a plate of glass having been found there, that glass windows were at that time in use, yet the first positive mention of them does not occur until more than two hundred years later.

It appears, however, that the art of making glass was understood in Britain before the Roman invasion; for thick rings of glass were at that period found in the island. They were denominated by the natives glass adders, and it is not improbable that they were distributed by the Druids as amulets. Some of these are still occasionally found in various parts of the country; they are of different colours, and a few of them curiously streaked, and we have the authority of history that domestic utensils were formed of the same metal.

We are told by the Venerable Bede, that artificers, skilled in making glass for windows, were first brought into this country from the continent in 674, and were employed in glazing the church of the monastery at Wearmouth. But the art was not generally practised, and the luxury of such windows was slowly adopted, for it was not until a century after the Norman conquest that they began to be used in private houses, and even then they were considered as marks of great magnificence.

The manufacture of glass was not commenced in England until the middle of the sixteenth century, at which time the chief works were in Crutched Friars; but the finer sort of flint glass was first made at the Savoy house, in the Strand. Considerable improvements were made about the year 1635, when a patent was granted to Sir Robert Mansell, who also possessed a monopoly of the importation of Venetian drinking-glasses, the art of making which was not brought to perfection, in this country, until the reign of William III. The first plate-glass was made in 1673, at Lambeth, and this manufacture was introduced by the Duke of Buckingham, who for that purpose brought over several Venetian workmen. From this period the manufacture of plate-glass, in this country and other parts of Europe, has received various improvements, a succinct account of which will be found under the head of Mirrors.

GLASS-CUTTING.

ANTIQUITY OF THE ART OF GLASS-CUTTING;—DIAMOND DUST;—DIAMOND PENCILS;—ANECDOTE OF FRANCIS I.;—INVENTION OF THE ART OF ETCHING ON GLASS.

It is generally supposed that the art of glass-cutting was invented by one Caspar Lehmann, who, in the year 1609, was in the service of the Emperor Rhodolphus II. as a lapidary. It is, however, sufficiently proved, by various articles still preserved in collections of antiquities, that the Greek artists formed upon glass both raised and engraved figures; and, although it is probable that pieces of glass may have been moulded like paste, for that is an art that was very anciently understood, it is yet certain that they cut all kinds of ornaments on glass with considerable accuracy in the modern manner. The learned Natter, indeed, affirms, in his treatise on engraved stones, that the ancients even employed the same instruments as the moderns; and it certainly does appear that they used a wheel which moved in a horizontal direction above the work-table, and seems to have been in most respects similar to the common lapidary's wheel.

Although it is also certain that the ancients employed diamond dust for the purpose of polishing various kinds of precious stones, it yet does not appear that they were acquainted with the mode of cutting glass with a diamond pencil. The oldest glaziers with whose manner of working we are acquainted used emery, with sharp-pointed instruments of steel, and a red-hot iron, by means of which they gave the necessary direction to the rents.

The first mention that is made of a diamond being employed for writing on glass, occurs in the history of Francis I. of France, who inscribed the following lines on a window at the castle of Chambord, near Blois, in order, as it is said, to intimate to the Duchess of Estampes that he was jealous:—

> "Souvent femme varie
> Mal-habil qui s'y fie."*

It has also been generally imagined, that the art of etching on glass, which is effected by an acid that dissolves silicious earth, was first invented in 1771, by a German chemist named Scheele; but it can be proved that it was discovered so early as 1670 by an artist named Schwanhard, who was celebrated as a glass-cutter, and by the mere accident of some aquafortis having fallen on his spectacles and corroded them.

At present the glass is spread with varnish, and the figures to be etched on it are traced through it; but Schwanhard first sketched the figures, then covered them with varnish, and corroded the glass around them with the liquid, by which means a bright smooth figure was produced upon a dim ground.

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* The pane of glass with the above inscription is still preserved at Chambord; but the anecdote has been usually attributed to Henri IV. The château is now the property of the infant Duke of Bordeaux, for whom it was lately purchased by a national subscription.

HYDROMETER.

OPERATION OF THE HYDROMETER;—ORIGINAL INVENTION;—SYNESIUS AND HYPATIA;—DESCRIPTION OF THE ANCIENT HYDROMETER;—REVIVAL OF THE INVENTION.

The hydrometer is an instrument which serves to determine the specific gravity of different fluids by the depth to which it sinks in them. The laws by which that comparative gravity is governed were discovered by Archimedes, on trying an experiment to ascertain the content of a golden crown made for Hiero, king of Sicily; and it has been thought not improbable, that he, at the same time invented the instrument in question. As he died two hundred and twelve years prior to the Christian æra, this would carry the invention back to a very remote period;

but it is not alluded to by authors of a much later date, and the first mention of it occurs in the letters of Synesius to Hypatia, in the beginning of the fifth century. The character and singular fate of these two persons—but little known to history—is sufficiently interesting to merit attention, and will, doubtless, excuse a brief digression.

Hypatia was the daughter of Theon, a celebrated mathematician of Alexandria, some of whose works are still extant. At an early age she acquired, from her father, a knowledge of the sciences, and, from other learned men, such an intimate acquaintance with the platonic and Aristotelian philosophy, that she taught them publicly with the highest applause. Young, beautiful, and accomplished, she was surrounded by admirers; but her devotion to the cause of learning precluded the indulgence of a softer passion, and she resisted every solicitation to become a wife.

At this time Alexandria was a prey to civil discord. The Patriarch of the Christian Church, Cyril, a man of an arrogant and vindictive spirit, and intolerant principles, blind to every consideration but what he deemed the interest of his faith, insisted on the expulsion of the Jews, to whom the city was indebted for much of its commerce, and consequent opulence. The measure was therefore opposed, upon every ground of policy as well as humanity, by the governor of the place; and he even punished, capitally, a Christian who was convicted of some crime against a Jew. Cyril took advantage of the circumstance to inflame the passions of his partisans; and, aided by the Monks, excited an insurrection among the Christian populace, who plundered the Jews, and expelled them from a city which had been the residence of their forefathers from the time of Alexander the Great.

Hypatia had not renounced the errors of paganism, and whether this alone, added to her justly great reputation, had inflamed the jealousy of the turbulent churchman, or that some imprudent remark on the recent events had stimulated his resentment, does not appear; but certain it is, that as he had incited the religious rage of the people against the unfortunate Jews, he in like manner instigated them to attack the innocent Hypatia. An infuriate mob seized the unoffending object of their fanaticism in the street, hurried her to the church,, where they stripped off her clothes, tore her flesh to pieces with pincers, then dragged her mangled limbs about the city, and at length burned them.

Among the most ardent of the admirers of Hypatia was Synesius; himself of a noble pagan family, a philosopher, and a mathematician. His learning, talents, and disposition, had gained him universal esteem; and such was the purity of his morals, that, notwithstanding his pagan creed, the Christian Church of Ptolemais desired to have him for their Bishop. Synesius listened to the proposal with reluctance, and at length only consented to accept of the office, on condition, *that he should not be required to subscribe to the doctrine of the resurrection of the dead!* Incredible as it may now appear, his terms were acceded to, and he was actually baptized, and installed, with that reservation; though he afterwards admitted the tenet of futurity. He died in

431, sixteen years after the tragedy we have recorded. His writings have been preserved; and among his correspondence with Hypatia, is the following description of the Hydrometer, or, as it was then termed, the *Hydroscopium.*

"It is a cylindrical tube, of the size of a reed; a line drawn upon it lengthways, is intersected by others, by which we learn the weight of the water. At one end of the tube there is a cone, the base of which is joined to that of the tube; and this part of the instrument is called the *baryllium.* When immersed in the water, the tube remains in a perpendicular position, so that the cross-lines can be counted, and by them the weight is ascertained." This is evidently an Hydrometer of the most simple construction: the cone, at the lower extremity, without being sufficiently heavy to entirely sink the tube, serves to keep it erect; the lighter the fluid is in which it is placed, the further it will descend; and the difference of gravity between any two liquids will be discovered by the scale of lines. Its correctness may be proved by filling a vessel alternately with an equal weight of different fluids, in which case the lighter will occupy more space than the heavier: thus, if twenty-one divisions of the instrument be covered in water, and twenty-four in oil, it will be found, that only twenty-one parts of oil can be contained in the same space occupied by twenty-four of water.

The knowledge of the hydrometer appears to have been lost during the middle ages, and not to have been revived until towards the close of the sixteenth century, when it was regarded as an entirely new invention. Various subsequent improvements have been made on it; and, by an ingenious graduation of the scale, founded on repeated experiments, it is now generally used to ascertain the strength of ardent spirits.

LINEN MANUFACTURE.

FLAX;—ANTIQUITY OF LINEN;—TABERNACLE OF THE JEWS; — EGYPTIAN MUMMIES; — INTRODUCTION OF LINEN INTO EUROPE;—PROGRESS OF THE MANUFACTURE;—ADOPTION OF LINEN IN DRESS;—MANUFACTURE IN ENGLAND, AND IN IRELAND.

FLAX was originally indigenous in the Levant, and it was long before it was introduced into Europe. While cotton was manufactured into cloth in the East-Indies, it is supposed that linen was equally common in Egypt. It is frequently mentioned in the old Testament, and particularly in the books of Moses, the most ancient of the Scriptural writers. Thus we read in the directions for the construction of the Tabernacle:—" Moreover, thou shalt make the Tabernacle with ten curtains of fine twined linen, and blue, and purple, and scarlet: with cherubims of cunning work shalt thou make them.* This, however, as the original Hebrew does not specify the substance of which the cloth called in the version, linen, was formed, would be only slight evidence of the manufacture of *Flaxen* cloth in Egypt at that period, were it not from thence that it was first obtained, and thence only that Europe was for a long time supplied with it. Mummies are also generally found swathed in linen; and, as the art of preserving bodies in that manner was practised in Egypt in the remotest ages, there can be no doubt that linen was made there at an æra of very great antiquity.

The ancient Greeks were unacquainted with the use of linen, and it was not until the second century of the Christian æra that it was introduced into Rome. Before that period the tunic or under garment of the Romans was made of wool, and the Emperor Alexander Severus is said to have been the first European who wore a linen shirt. But this luxury was then so ill understood, that the web was usually interwoven with threads of gold, by which the softness of its texture was entirely destroyed.

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* Exodus, ch. xxvi., v. 1.

The manufacture of linen made but little progress in Europe during the middle ages. It was confined, both then and for a long period afterwards, to private families, where the thread was spun and the web was wove for domestic use; and its scarcity, as an article of apparel, has been considered as one chief cause of that cutaneous disorder formerly known under the name of leprosy. There is a letter extant, from St. Boniface to a German Bishop, written in the eighth century, in which he mentions having sent some napkins to him, as a great rarity. La Flamma, a writer of the fourteenth century, says that, in the time of Frederic Barbarossa, linen was so little known, that shirts of serge were generally worn in Milan; and, about the same period, flannel, or rather that coarse stuff, vulgarly termed linsey-wolsey, formed the usual underclothing of ladies. Linen seems indeed to have been earlier adopted as a luxury for the table than the person, and we read of its being used at banquets long before it was known as an article of dress.

It has been supposed that the linen manufacture was introduced into this country by the Romans; but of that there is no proof. It is, indeed, probable, that, like other arts with which the Romans were acquainted, it may have been partially known; but no vestiges of it have been discovered, and if it really was practised at that period, it was afterwards lost, and only slowly recovered; for although it is true that linen was in use in England many centuries ago, yet it was then imported from Flanders.

The chief linen manufacture of the British dominions has been long established in the North of Ireland, where it is carried on to an extent that renders it one of the most valuable staples of the united kingdom. The importance of the trade may be estimated from the fact, that more than 40,000,000 yards of linen cloth are, upon an average, annually exported from Ireland; and its progressive increase has been so rapid, that it is now ten times greater than it was in the middle of the last century.

MIRRORS.

ANTIQUITY OF MIRRORS;—BRAZEN LAVER OF THE TABERNACLE;—ANCIENT MIRRORS OF SILVER AND OF MIXED METAL; — OBSIDIAN STONE; — PHENGITES; — MIRRORS OF THE PERUVIANS; — TYRIAN GLASS-HOUSES; — INVENTION OF GLASS MIRRORS;—VENETIAN LOOKING GLASSES; — FRENCH GLASS-HOUSES; — MANUFACTORY OF ST. ILDEFONSO; —BRITISH PLATE GLASS MANUFACTORY.—CONCAVE MIRRORS.

A LUCID stream was doubtless the first mean through which the charms of the shepherdesses of the golden age were reflected; but there is reason to believe that artificial mirrors were made, almost as soon as the ingenuity of man was exerted on mechanical objects, and as every solid body capable of receiving a fine polish would suit this purpose, we find that the oldest mirrors mentioned in history were of metal. Thus

Moses relates that the brazen laver of the Tabernacle was made from the mirrors of the women, and similar allusions are to be found in other parts of the Old Testament.* It is, indeed, true, that in the common English version of the Scriptures, the word "*looking-glass*" is employed instead of *mirror;* but this is one of the numerous verbal inaccuracies in that translation, in the original of which the term is not to be found.

Some commentators on the writings of the ancients have conjectured that mirrors were not known in the time of Homer, because he does not mention them in the description which he gives in the Iliad† of the toilet of Juno, and the objection must undoubtedly be admitted to possess considerable weight; but on the other hand it has been observed, that the ancient mythologists did not consider it becoming in either Juno or Pallas to have recourse to an instrument of mere mortal vanity: though, in opposition to this argument we find, that Apuleius, in his *Floralia*, enumerates mirrors among the valuables belonging to Juno in the island of Samos. Others have ascribed the invention of mirrors to Æsculapius, and Cicero has been quoted as authority for the supposition, but it would appear from the passage in his writings that he alluded to the more probable instrument, a probe.*

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* "*Old Testament.*" And he made the laver of *brass*, and the foot of it of *brass*, of the *looking-glasses* of the women assembling, which assembled at the door of the Tabernacle of the congregation. *Exod.* ch. xxxviii. v. 8.

† "*Iliad.*" lib. xiv. v. 166.

The greater number of the ancient mirrors were made of silver; not so much, however, with a view to magnificence, as because silver is the fittest of the unmixed metals for that purpose. When silver plate is mentioned in the Roman laws, in allusion to heirships, mirrors of this description are rarely omitted, and the satirists of the latter ages of the republic describe them as being so common, that no young woman was without one. At first, only the finest silver was employed; but it was afterwards used of an inferior quality, and, what must now appear singular, the presence of the alloy was discovered by the smell. Pliny tells us that Praxiteles invented silver mirrors in the time of Pompey the Great; but, unless he merely alluded to their introduction among the Romans, the correctness of his assertion is disproved by a passage in Plautus,[*] from which it appears that they were in use at a much earlier period in Greece. They were often so large as to reflect the entire figure, and were formed of thin plates or of coarser metal silvered over. Mirrors were also formed of a mixture of copper and tin, and the bset, as Pliny informs us, were made at Brundusium. This mixture produces a white metal that is proper for the purpose; but unless preserved with great care, it is apt to grow dim, and on this account a sponge and pounded pumice-stone were usual appendages to the ancient mirrors. Some of them are still preserved in collections of antiquities; and from chemical experiments made by

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* "*Probe.*" Æsculapiorum primus qui *specillum* invenisse et primus vulnus obligasse dicitur. *De Nat. Deor.* iii. 22.

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[*] *Plautus.* Mostell, act i. sc. 3.

Count Caylus,* on one that was found near Naples, it would appear that regulus of antimony also entered into their composition; but this was no doubt of comparatively modern date, for that substance was not known to the ancients.

Mention is also made in various ancient authors of mirrors formed of obsidian stone, or, as it is now commonly termed, Icelandic agate; but they seem to have been rather for ornament than use, and were chiefly employed for pannels in the walls of splendid apartments. We also learn that Domitian caused a gallery in which he used to walk to be lined with a substance termed *phengites*, which reflected whatever passed before it, and which probably was a calcareous or gypseous spar, or selenite. The black marble of Chio was also used for a similar purpose.

It is a curious fact, that mirrors, both plane, convex, and concave, were found among the Peruvians on the first discovery of America. Some of them were made of a black, vitrified lava, called by the Spaniards *gallinazo*, which is similar to the obsidian stone of the Romans. They had others also of a fossil which they termed the Inca's stone, which was a compact pyrites or marcasite, susceptible of a very high polish. One of these was a foot and a half in diameter, but in general they did not exceed two or three inches. It appears even that the Americans were in possession of mirrors of silver, copper, and brass.

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* "*Caylus.*" Recueil d'Antiquités, tom. v. p. 174.

The date of the invention of glass mirrors has long been a subject of discussion among antiquaries. The authority of Pliny has been adduced to prove that they were formed in the ancient glass-houses of Tyre, and his language is so clear, that no doubt can be entertained of some attempts of the kind having been made.* It is, however, far from certain that those experiments were successful; for Pliny would scarcely have omitted to speak more particularly of so important a discovery, if it had been completed, nor could it have failed to have superseded the less useful employment of metal for the same purpose. Besides, although glass was held in the highest estimation at Rome, and although it is often mentioned by ancient writers among the most costly pieces of household furniture, yet mirrors are only alluded to among articles of plate.

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* Aliud vitrum flatu figuratur, aliud torno teritur, aliud argenti modo cœlatur, sidone quondam iis officinis nobili siquidem etiam specula excogitaverat. Hæc fuit antiqua ratio vitri. *Plin. Hist. Nat.*, lib, xxxvi. cap. 26.

It is probable that the first glass mirrors were made of some dark coloured glass resembling the obsidian stone, and that a long time elapsed ere the idea occurred of covering the back part with some opaque substance. It has, indeed, been conjectured by Dr. Watson, and others, that this discovery must have been made at an early period—because it was so apparent; but the supposition rests upon no stronger foundation. It has not been alluded to by Alhazen, the Arabian, who, in the eleventh century, wrote a treatise on optics; nor by the Italian Vitello, who treated of the same subject near two centuries later; and there is no positive evidence of its having been known sooner than about the year 1279. At that time an English Franciscan monk, named John Peckham, wrote a work on optics, which has been since printed, in which he not only speaks of glass mirrors, but also mentions that they were covered on the back with lead. We may, indeed, conclude that this invention cannot be much older, from the circumstance that glass mirrors were scarce in France even in the fourteenth century, while mirrors of metal continued in common use; and we are expressly told that Anne de Bretagne, wife of Louis XII., used one of the latter description.

Of the progress of the art little more is known except that, at first, melted lead was poured over the glass plate while yet hot as it came out of the furnace, and that afterwards an amalgam of tin was applied. The method which approaches the nearest to that still in use, seems to have been first practised in the sixteenth century at Murano, in the Venetian territory, the glass works at which place for a long time furnished all Europe with the largest and finest mirrors. Tin foil was spread out smoothly, and rubbed over with quicksilver, and, when the tin was saturated, it was covered with paper. The glass was then laid upon it, and while the workman pressed it firmly down with one hand, he, with the other, carefully drew out the paper which lay between the tin and the glass, over which a heavy weight was afterwards laid in order to make them adhere.

The first attempts to establish a manufactory of mirrors in France, were made towards the middle of the sixteenth century. One Eustache Grandmont first obtained a patent for that purpose in the year 1634, but his undertaking failed; and it was not until 1665 that the project, being patronized by Colbert, was attended with success. At that period Nicholas de Noyer obtained an advance from the Crown of twelve thousand livres for four years, to assist him in establishing a manufactory after the Venetian method. With this slight assistance, he, in conjunction with one Poquelin, who had been a large dealer in Venetian glass, erected the first works for that purpose at the village of Tourlaville, near Cherbourg. The largest plates that were there made did not exceed fifty inches in length: but, in 1693, one Thevart obtained another patent for casting plates of larger dimensions, and he succeeded so far as to form them eighty-four inches in height by fifty in breadth. This manufactory was established at the palace of St. Gobin, in Picardy, and the interests of the patentees were afterwards joined with those of the proprietors of the original works at Tourlaville, at both which places mirrors of great size and beauty are still made. They were, however, excelled, in point of size at least, by those made at the celebrated manufactory at St. Ildefonso, belonging to the Crown of Spain, where the largest mirrors ever constructed continued to be made until the irruption of the French into that country, during the late war, and the events that followed put a stop to the works.

In this country an extensive manufactory of what is commonly called plate-glass, that is, glass which is cast instead of blown, was first established in Lancashire in 1773, and was incorporated by Act of Parliament. It has not, however, been attended with any extraordinary degree of success; and, although mirrors of very large dimensions are there made, they are not considered equal in brilliancy and richness to those of either France or Spain.

In one delicate and most difficult branch of the art, however, the English manufacturers excel all others, for they have succeeded in making concave mirrors of a size and accuracy unknown on the continent.

MUSICAL-NOTE MACHINE.

ORIGINAL INVENTION;—FREKE;—UNGER;—HOHLFELDT; —DR. BURNEY'S MUSICAL TOUR.

It is somewhat singular, that two persons, one an Englishman—Mr. John Freke—and the other a German, of the name of Unger, should have simultaneously conceived the idea of constructing a machine "that shall write extempore voluntaries, or other pieces of music, as fast as any master shall be able to play them upon an organ, harpsichord, &c."

The words here quoted are taken from the Philosophical Transactions for the year 1747, but they are not accompanied with instructions for making the instrument. That honor was reserved for Hohlfeldt, who is mentioned in the article *Odometer*, and who succeeded in forming the machine in question, a complete description of which is inserted in the "*Mémoires de l'Académie de Berlin*, 1771."

In Dr. Burney's Musical Tour, it is mentioned as an English invention, in consequence of the article in the Philosophical Transactions already alluded to; but that only conveyed the idea; the execution undoubtedly belongs to Hohlfeldt, assisted perhaps by the more detailed description given by Unger, in his communication to the Berlin Academy in 1752.

ODOMETER.

ANTIQUITY OF THE ODOMETER;—ITS APPLICATION;—AND PERFORMANCE;—ANCIENT ODOMETER AT DRESDEN;—ENGLISH INVENTION;—PEDOMETER;—MERLIN'S CARRIAGE.

THE instrument known as the Odometer, by which the revolutions of the wheels of a carriage may be ascertained, is supposed to have been known to the Romans. Vitruvius describes a machine of this kind; and the Emperor Commodus is said to have possessed carriages, with various wheels, which measured the road, and even indicated the hours.

That it was known in the fifteenth century, appears from a carving on the front of the ducal palace at Urbino, erected in 1482; but it is there applied to a ship. At a period not greatly subsequent, in 1550, a degree of the equator was measured with it, between

Amiens and Paris: it was affixed to a carriage, the wheels of which made one hundred and seventy thousand and twenty-four circumvolutions, which were each marked, as we are told, by the striking of a hammer on a bell. These, being reduced into feet, were found to amount to fifty-six thousand seven hundred and forty-seven toises, which is within three hundred of what it has been found by later measurement.

In the collection of curiosities at Dresden, is an Odometer, which the Elector of Saxony employed, from the year 1553 to 1586, in measuring his territories: and the Emperor Rodolphus, who reigned from 1576 to 1612, possessed two of these instruments, which not only measured distances, but marked them, at the same time, on paper.

Towards the close of the seventeenth century, an English artist, named Butterfield, invented an odometer; and from that period, various foreigners improved upon the machine, until, in the middle of the last century, an ingenious German mechanic, of the name of Hohlfeldt, appears to have invented the pocket pedometer, by means of which the number of steps which a person takes, while walking, may be counted. In our own times, many persons must recollect the equipage of the celebrated Merlin, which was continually to be seen in the streets of London, with an odometer so constructed as to mark the revolutions of the wheels on an index placed in front of the carriage.

These machines are now in common use for measuring distances in land-surveying, but are rarely applied to carriages.

ORRERY.

PLANETARINA ;—GRAND ORRERY ;—LORD ORRERY ;—GRAHAM'S ORRERY ;—ROWLEY'S ORRERY ;—FERGUSON'S ORRERY ;—PRIESTLEY'S ORRERY ;—REV. DR. PIERSON'S ORRERY AND PLANETARY MACHINES ;—BUSBY'S SELF-ACTING HYDRAULIC ORRERY ;—WALKER'S ORRERY.

THE Orrery is a machine made use of to shew the positions and motions of the heavenly bodies, *i.e.* the planets and their respective satellites. The orrery differs from the instrument termed a "planetarium," inasmuch as it shews the rotatory, or *diurnal* motions of the primaries, and the satellites moving about them in their particular orbits, whereas the "planetarium" merely shews the *annual* motions of the primaries themselves. But to constitute an "orrery," it is not necessary that all the planets should be included. A machine representing the motions of the sun, the earth and the moon alone, would still be called an "orrery," whereas if the whole system were included, it would be termed "The Grand Orrery."

This machine derives its name from the circumstance of an apparatus of this description having been made for the Earl of Orrery by a person named Rowley, shortly after the year 1715.

In searching for the history of this interesting machine, it will be found that in the year 1715, an instrument of this kind was made by Mr. George Graham, but confined to the representation of the motions of the sun, earth, and moon; being forwarded through the hands of some workmen to Prince Eugene, it fell, in some way or other, under the observation of Rowley, who immediately conceived and executed the idea of producing a prototype, under the patronage of Lord Orrery. Sir Richard Steele, ignorant of the origin of Rowley's instrument, named it the "Orrery," in compliment to the nobleman who bore that designation.

To enter into the minutiæ of these instruments would be foreign to the plan upon which this work is undertaken; suffice it therefore to say, that, it is admitted on all hands that Rowley improved upon Graham, and extended his apparatus to all the superior planets then know. A superb Orrery was subsequently made under his direction by T. Wright, mathematical-instrument maker to George the Second, in the year 1733, and is still preserved at Richmond Observatory.

The celebrated James Ferguson next invented and constructed several instruments for illustrating astronomical phenomena; his principal work comprized the Sun, Mercury, Venus, the Earth, and the Moon; and is described in his book entitled "Select Mechanical Exercises."

Next in order comes the "Orrery" of James Priestley, Esq., of Bradford, in the county of York. This gentleman was a relative of the famous Dr. Priestley, his orrery was made for Dr. Birbeck, the successor of Dr. Garnett, professor at the University of Glasgow. A considerable degree of perfection was attained by Mr. Priestley; and his Orrery included the orbit of Saturn.

But the person who has carried these mechanical contrivances to the greatest perfection, is the Rev. Dr. Pearson. This gentleman has not only constructed the "Grand Orrery," on a principle of mechanical accuracy heretofore deemed unattainable, but has expended a sum of *ten thousand pounds* in producing a variety of the most elaborate planetary machines, constructed on such unerring principles as to enable him practically to ascertain, without the aid of calculation, the series of eclipses of the sun and moon, and of Jupiter's satellites; the transits of the inferior planets; the occultation of the fixed stars, for many succeeding ages. These are minutely described in Dr. Rees's Cyclopædia, to which work we must beg to refer our readers for the particulars.

Last in order of time comes the self-acting Hydraulic Orrery, recently invented and constructed by Mr. Busby, on a principle entirely different from any that has yet been devised. The effect of the various spontaneous motions is truly magical; the machine displays with the most impressive silence, and with the most harmonious movements, the circuits, obliquities, parallelisms, and rotations of the sun, the earth, and the moon, on an area five feet in diameter, while the unruffled surface of the fluid beneath reflects the system, and doubles the illusion. Mr. Busby has also constructed a floating machine, by means of which he illustrates the motions of Jupiter and his satellites in a most interesting manner. He has besides arranged a more extensive plan for the "Grand Orrery," and intends to display the whole planetary system on hydraulic principles. Mr. Busby's present Hydraulic Orrery is publicly exhibited.

We cannot conclude this article without alluding to the well-known Transparent Orreries of Walker and others. These, however, are merely calculated for scenic representation, and their mechanism does not extend to the oblique motions, upon which some of the most important astrononomical phenomena necessarily depends. But it must be admitted, on all hands, that they have been of the greatest use in directing the public attention to astronomical objects; and in promoting the cause of science in her most extended operations.

RIBBON-LOOM.

DESCRIPTION; — MANUFACTORY IN THE MILANESE; — INVENTION;—DANTZIC RIBBON-LOOM;— SINGULAR PREJUDICE;—DUTCH LOOM-ENGINE;—ESTABLISHMENT IN ENGLAND.

In the general construction of its parts, this loom bears a strong resemblance to the common weaving-loom; but it has this one material advantage, that while the workman at a common loom can only weave one piece, he can, with this machine, make as many as twenty at one time, and these even of different patterns. It is so formed as that the weaver can move the batton both towards and from him, and also to the right and left, with all its shuttles; and it is furnished with machinery below, which can be moved by a person unacquainted with the art of weaving, and which keeps the entire loom and shuttles in regular motion. At a ribbon manufactory in the Milanese, there were, not many years ago, thirty of these looms, the machinery of which was worked by water, each of which could weave twenty-four pieces together; so that, when the whole were employed, they made, at once, sixty dozen pieces.

Of their first invention, there is no certain information: it has been attributed to the Swiss; but the first positive account mentions it as having been invented at Leyden, about the year 1621. There is, however, in the works of the Abbot Lancellotti, published in 1629, a circumstantial narrative of a ribbon-loom, which was invented, at Dantzic, about fifty years before, and which, when set in motion, made from four to six pieces, of itself: ("*da se Stesso;*") but the magistrates of the town, fearing lest by this invention many workmen might be deprived of employment, interdicted its use; and it farther appears, that, not content with this prohibition, they even caused the inventor to be privately strangled!

This prejudice against the introduction of machinery, which is not even at present without its advocates, was formerly so strong, that many ingenious contrivances to lessen labour were suppressed by governments, as injurious to population, and consequently to the state. The States-General of Holland, in that view, repeatedly circumscribed the use of the ribbon-loom, although they did not altogether abolish it: in the Spanish Netherlands, and throughout the greater part of Germany, it was strictly prohibited; and the council of Hamburgh ordered a loom to be publicly burned. But these coercive measures were unavailing: as some places still remained open to its introduction, the manufacture of ribbons was gradually removed to those cities where the establishment of the new loom was permitted, and became lost to those governments which opposed its adoption. Insomuch, that not only were they at length forced to retract the prohibitions formerly issued against its use, but finally to offer premiums for its employment.

The ribbon-loom was brought to England, from Holland, in 1676, and was then called the Dutch loom-engine. Its introduction occasioned some disturbances among the ribbon-weavers in London, but its evident utility ensured its adoption.

SAW-MILLS.

ANCIENT MODE OF PRODUCING PLANK;—SPLIT-TIMBER; ANTIQUITY OF THE SAW;—INVENTION;—ANCIENT PAINTING AT HERCULANEUM;—INVENTION OF SAW-MILLS;—ESTABLISHMENT IN ENGLAND;—DUTCH AND SWEDISH MILLS;—BRUNEL'S MILL.

At an early period, the trunks of trees were split into planks with wedges, and these were afterwards reduced by the operation of the adze. Before the middle of the sixteenth century, all the plank in Norway was hewn in this manner, and trees, from which seven or eight boards could now be procured, then only produced two. This simple but wasteful mode has not, in some parts of the North, been even yet entirely exploded; and it must be admitted, that it is attended with some advantages which the saw does not possess. The work is more expeditiously performed;

and split timber is far stronger than that which has been sawn; for, the fissure follows the grain of the wood, and leaves it undivided, whereas the saw, by cutting along a specific line, divides the fibres, and thus weakens its cohesion and solidity: besides, as the fibres retain their natural position, they are easier bent, and this is an advantage, in many kinds of work, which more than compensates for the timber being sometimes warped.

The saw is, however, an instrument of the most remote antiquity; and its advantages were so well appreciated by the ancients, that they ranked the inventor among the Gods. The discovery was attributed to the accidental use of the jaw-bone of a snake in cutting through a piece of wood; which is not improbable, as some snakes have teeth of that kind; and in some of the recently discovered Islands in the Pacific Ocean, the natives appear to have made use of the serrated bones of fish for a similar purpose.

The form of the ancient saw has been accurately ascertained through the preservation of a curious relic of antiquity found among the ruins of Herculaneum. It is a painting, in which are represented two genii, in the act of sawing a piece of timber: the plank is extended on a long bench, to which it is fastened with cramp-irons, and over one end of which it projects; here the workmen are seen, one standing, the other seated on the ground, performing the operation with a frame-saw, which appears, in every respect, similar to that still in use. The blade is fixed in a square frame, the handles of which are formed as at present, and the teeth stand perpendicular to the plane of the frame; the cramps are shaped like the figure 7, which is the form still adopted in some kinds of work; and the bench itself bears a strong resemblance to the modern carpenter's table. In another part of the picture, is a small tablet affixed to the wall, on which is a vase, the use of which must be left to conjecture.

The ingenious improvement of this instrument, by adapting it to mills, was first introduced in Germany, and so early as the year 1322, we find saw-mills established at Augsburgh. From that period they became so general, that, on the settlement of the island of Madeira, they were erected there by the Portuguese; and Abraham Peritsol, a Jew who wrote in the beginning of the sixteenth century, describes them as having been employed to furnish the city of Lisbon, from the forests of the island, with large quantities of plank of various rare wood, of which was formed the most beautiful furniture. The Bishop of Ely, who was Ambassador from Mary, Queen of England, to the Court of Rome, in 1555, thus describes one which he saw in the neighbourhood of Lyons:—"the saw-mill is driven with an upwright wheel, and the water that maketh it go is gathered into a narrow trough, which delivereth the same water to the wheels. This wheel hath a piece of timber put to the axle-tree end, like the handle of a broch, and fastened to the end of the saw, which, being turned with the force of the water, hoisteth up and down the saw, that it continually eateth in, and the handle of the same is kept in a rigall of wood from swerving. Also, the timber lieth as it were, upon a ladder, which is brought by little and little to the saw with another vice."

This invention, however, does not appear to have been adopted in England until 1663, when a Dutchman erected one near London; but it was so violently opposed by the sawyers that it was soon abandoned. From this period, no effectual attempts seem to have been made for its introduction, until about the year 1767, when a saw-mill, driven by wind, was erected at Limehouse, under the direction of one Hansfield, who, however, had learned the manner of constructing it in Holland; but this was soon destroyed by a mob; and although it was afterwards rebuilt, the plan has not, even yet, been generally acted upon. In every other part of the North of Europe, however, and in America, it has long been in activity. Saardam, in Holland, is supposed to possess a greater number of saw-mills than any one other place; but the largest is in Sweden, where one water-wheel, of twelve feet diameter, drives at once seventy-two saws.

But every invention of this kind has been eclipsed by the circular saws in the mills belonging to the ingenious Mr. Brunel, so well known for the contrivance of the admirable apparatus in Portsmouth Dock-Yard for cutting ships' blocks. These mills are erected at Battersea. The saws are four in number, two of eighteen, and the others of nine feet in diameter: they are, in fact, wheels edged with slender saws which cut through the wood without occasioning much waste; and are turned by a steam engine of sixteen horse power, which, at the same time, draws the timber to them. The larger saws revolve sixty-five times in a minute; therefore, the circumference being equal to a trifle more than three times the diameter, or to fifty-four feet and a fraction, gives a rate of velocity equal to about three thousand seven hundred feet in that space of time. This is supposed to be full forty times greater than that of the average stroke of the common upright sawyer's tool; while the accuracy with which the work is performed by the former, and the saving of the wood, cut into saw-dust by the latter, are decisive of their superiority. Planks of fine wood are thus cut into veneers, for cabinet-work, of the sixteenth part of an inch in thickness, and that with a rapidity and precision that are truly astonishing.

STEAM-ENGINE.

MARQUIS OF WORCESTER'S;—SAVARY'S;—AMONTON'S;—PAPIN'S;—BLAKEY'S;—NEWCOMEN'S;—BEIGHTON'S;—SMEATON'S;—WATT'S;—WALFE'S;—TREVETHIC'S.

THIS grand machine was entirely unknown to the ancients; it is used as a *primum mobile*, or first mood, of other machines, and its powerful effects are the result of the scientific combinations by which the immense expansive force exerted by water, when converted into steam, is rendered available to the most important purposes. In its original imperfect state, it was called the "*Fire-Engine.*"

The power of steam had been proved by the œlipile, long before the project of the steam-engine; for it appears that an Italian philosopher named Brancas, did actually contrive the plans of several mills to be worked by the reactive impulse of large œlipiles.

The original projector of the Steam-Engine is generally believed to have been the Marquis of Worcester; but his apparatus was intended to raise water by the expansive force of steam only. A short account of this first steam-engine we extract from a work by the Marquis himself, entitled "A Century of Inventions," (of which it is one), and published as early as 1655.

"68. An admirable and most forcible way to drive up water by fire; not by drawing or sucking it upwards, for that must be as the philosopher calleth it *intra sphœrum activitatis*, which is but at such a distance. But this way hath no bounder, if the vessel be strong enough: for I have taken a piece of whole cannon, whereof the end was burst, and filled it three-quarters full of water, stopping and screwing up the broken end, as also the touch-hole; and making a constant fire under it, within twenty-four hours it burst, and made a great crack; so that having a way to make my vessels, so that they are strengthened by the force within them, and the one to fill after the other, I have seen the water run like a constant fountain stream, forty feet high: one vessel of water, rarified by fire, driveth up forty of cold water; and a man that tends the work is but to turn two cocks, that one vessel of water being consumed, another begins to force and refill with cold water, and so successively; the fire being tended and kept constant, which the selfsame person may likewise abundantly perform, in the interim between the necessity of turning the said cocks."

The project of the Marquis of Worcester was neglected in his own age, nor does the subject appear to have excited the attention of scientific persons, till the year 1698, when Captain Savary obtained a patent for a new invention for raising water, and occasioning motion to all sorts of mill-work, by the impellent force of fire. This patent is dated 25th July, in the tenth year of the reign of William the Third—that is, 1628.

Captain Savary produced a working model of his engine before the Royal Society, as appears by the following extract from their Transactions for that year :—

"Mr. Savary, June 14, 1699, entertained the Royal Society with shewing a small model of his engine for raising water by help of fire, which he set to work before them: the experiment succeeded according to expectation, and to their satisfaction."

About the same period M. Amonton, a Frenchman, devised what he called the "fire-wheel," and pretended that Savary had borrowed from him; but the projects of Savary and Amonton were widely different, and time has nearly consigned that of Amonton to merited oblivion.

The next pretender to the improvement of the steam-engine was Dr. Papin, who in 1707 published a tract, containing an account of his invention, entitled "*Ars nova ad aquam ignis adminiculo efficasissime elevandum.*" Belidor, in his "*Architecture Hydraulique,*" has described this engine to be mainly the same as that suggested by the Marquis of Worcester, and by no means comparable with what had already been done by Captain Savary.

In 1766, Mr. Blakey endeavoured to improve upon Savary's engine; he took a patent for his supposed amendments, but never performed any thing worth recording.

Several other ingenious men turned their attention to the improvement of the steam-engine, with a view to reduce the consumption of fuel, which was found to be so immense, as to preclude its use, except under very peculiar circumstances. Among these may be named Newcomen, Beighton, and Smeaton; but nothing essential was achieved except by the philosophical genius of Mr. Watt, then a mathematical-instrument maker at Glasgow. Being accidentally employed to repair a model of the then imperfect steam-engine, Mr. Watt observed that a great quantity of heat was lost by the unnecessary, and improper mode of condensing the steam: he completely obviated this defect, and by the introduction of a condenser *apart* from the cylinder, and an alternate action of the steam against each side of the piston, he effected every *essential* improvement of which this grand machine was then capable.

We do not, however, mean to say that Mr. Watt's improvements were confined solely to these objects. He also improved the mechanical arrangement throughout; but although in so doing he evinced the utmost ingenuity, yet his exertions in this particular bear no sensible ratio to the magnitude of his other labours.

Mr. Watt obtained his first patent in 1769; but his first large engine was not completed till 1774. Finding his patent likely to expire before he had realized any advantages from his labors, Mr. Watt appealed to Parliament, obtained an extension of the term for twenty-one years, from 1775; and ultimately obtained the just meed of his unremited exertions.

Since Mr. Watt's Parliamentary Patent has expired, a variety of other improvements have been made by various mechanical gentlemen, and a species of steam-engine, termed "high-pressure," has been introduced. These high-pressure engines are, however, in many of their most advantageous points of construction, upon the principles previously laid down by Watt: and although they have a manifest advantage in their diminished size and consumption of fuel, yet are they attended with the serious risk of the most fatal accidents, by the *bursting of their boilers.* Messrs. Wolfe and Grevettire have most distinguished themselves in the construction of high-pressure steam-engines.

Steam-engines are now common all over the world; from England they have spread over the civilized surface of Europe. They are already known in India, and some hundred steam-boats, many of them of from five hundred to one thousand tons burthen, are worked on the immense inland waters of the American continent; as well as about our own sea-coasts, and those of the United States. A steam-ship—the Savannah—actually crossed the Atlantic Ocean from Savannah to Liverpool in 1819, from whence she proceeded to St. Petersburg.

STOCKING-FRAME.

KNITTING; — NETTING; — STOCKING-KNITTING; — ST. FIACRE; — ROWLEY'S POEMS; — CLOTH-HOSE; — INTRODUCTION OF KNIT-STOCKINGS INTO ENGLAND; — INVENTION OF THE STOCKING-LOOM; — ESTABLISHMENT OF THE STOCKING MANUFACTORY IN NOTTINGHAMSHIRE.

They who reproach the fair sex with the time lost in rendering themselves agreeable to the men, should not forget, that the former know how to pass those hours in useful employment, which the latter devote to mere social enjoyment. Among those lighter occupations of females, which serve to fill up vacant time agreeably as well as profitably, few possess so many advantages as that of knitting. It neither distracts the attention from conversation, nor checks the powers of the imagination—requires no ungraceful position—occasions no straining of the sight—is performed as conveniently when standing or walking, as when sitting—may be interrupted without loss, and resumed without trouble—the whole apparatus costs but a mere trifle; and is so portable that it can occasion the fair artist but little inconvenience.

There are two methods of knitting, each essentially different from the other; the one employed for the purpose of weaving nets, the other of making stockings. The first is performed by knotting into meshes that cannot be unravelled; the second, by a certain arrangement of loops so connected with each other as to be highly elastic without separation, yet capable of being unravelled, and having the same thread applied to any other use. The former was well known to the ancients; but the Greeks and Romans were unacquainted with the use of hose, and the art of stocking-knitting is of much later invention. It seems more than probable that it was not discovered until the sixteenth century; but it is quite uncertain to whom, or even to what nation, we are indebted for it.

The earliest certain account of this kind of knitting is contained in the letters patent for the foundation, in France, of a corporation termed the *communauté des maîtres bonnetiers au tricot*, dated in August 1527; and, from their having been then so numerous as to form a guild, we must suppose that the art had been already practised for some considerable time. These knitters chose St. Fiâcre,* who it seems was a Scotchman, for their patron; and from this circumstance, added to a tradition that knit-stockings were first brought to France from Scotland, a conjecture has been hazarded that the invention is due to the latter country. But, although the term *bonnetier*, in a general sense, implies hosier, it is probable that we should here confine it within its stricter meaning of bonnet-maker, for there is abundant proof that knit-stockings were not made in this country, until some years after the date of the French patent, and it is not credible that the English could have remained so long unacquainted with such an important invention of their nearest neighbours. Stowe, indeed, says, in his Chronicle, that the first stockings knit in England, of woollen yarn, were made in the year 1564, by William Rider, an apprentice of Master Thomas Burdet, who, having accidentally seen, at the shop of an Italian merchant, a pair of worsted stockings, from Mantua, borrowed them, and made another pair in exact imitation: but it must be admitted that the correctness of the date, if not of the fact itself, is exposed to suspicion.

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* "*St. Fiâcre.*" See also the article *Coaches*, v. i. p. 100. A fair is annually held in his honor near Paris.

The subject has been investigated with more than ordinary interest in consequence of the celebrated Chatterton's imitations of the poet Rowley having contained the following lines:—

> " As Elynour bie the greene lesselle was syttinge,
> " As from the sone's heat she harried,
> " She sayde, as her whytte hondes *whyte hosen were knyttinge,*
> " Whatte pleasure ytt ys to be married!"
>
> *Song by Sir Thybbot Gorges in the Entrelude of Ella,* 208.

As Rowley flourished about the middle of the fifteenth century, when the art of knitting was not supposed to have been known, they who doubted the authenticity of the poems, insisted that the allusion to it was an anachronism, which, of itself, destroyed their claim to originality; while those who supported their genuineness, endeavoured to prove that the invention was older than was generally imagined. The result of the research occasioned by this memorable literary dispute has furnished us with the following particulars.

In Howell's General History, it is related, "that Henry VIII. wore ordinarily *cloth-hose*, except there came from Spain, by great chance, a pair of silk-stockings. King Edward, his son, was presented with a pair of long Spanish silk stockins, by Thomas Gresham, his merchant, and the present was taken much notice of. Queen Elizabeth, in the third year of her reign, was presented by Mrs. Montague, her silk-woman, with a pair of black knit silk stockins, and thenceforth she never wore cloth any more." However, a German writer* says, that Queen Elizabeth was eighteen years on the throne before she wore silk stockings, when the Earl of Derby presented her with a pair that had been made at Milan.

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* "*German writer*," Joh. Joach. de Rusdorff, Consilia et negotia politica, Francof. ad M. 1725.

With respect to the *cloth-hose*, it is probable that they were like our gaiters; for, in 1558, the fifth year of Queen Mary, we find that Dr. Sands, afterwards Archbishop of York, while confined in the Tower, had a pair of hose made for him *by a tailor*. This would go far to prove that knit stockings were not even then generally worn in England, were it not probable that the clergy and elderly people adhered for a long time to the old fashion. But, that woollen stockings were not only in use, but perhaps knit, in this country, during the reign of Henry the Eighth, seems placed beyond doubt by an authentic and curious household book kept in the family of Sir Thomas L'Estrange, of Hunstanton, in Norfolk, in which are the following entries:—

"1533. 25. H. 8. 7, Sept.—Peyd for 4 peyr of knytt-hose, viii *s*."

"1538. 30. H. 8. 3, Oct.—Two peyr of knytt-hose, i *s*."

the first mentioned, it is to be observed, were for Sir Thomas himself, the last for his children.

That stockings were considered at that period as a part of dress, is also proved by an estimate then made of the revenues of the Bishopric of St. Asaph; amongst which are enumerated, as perquisites on the death of every clergyman who held a living within the diocese,—"his best coat, jerkin, doublet, and breeches: item, his hose or nether stockings, shoes and garters." And in a collection of the Acts of Edward VI., printed in 1552,* is one for the regulation of the trade in woollen goods, in which mention is made of knitte peticotes, knitte gloves, and knitte hose."

About 1577, that is, within thirteen years after the anecdote recorded by Stowe, we find knitting spoken of as common throughout England; and two years after this, when Queen Elizabeth was at Norwich, several small female children were exhibited before her, some of whom were spinning worsted yarn, and others knitting worsted hose. But whether Stowe was correct in the date which he has ascribed to the invention, or that it should be placed at an earlier period, it is evident that it cannot be carried farther back in this country, than towards the middle of the sixteenth century.

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* This Act is not to be found among the *Statutes at large*: because, as it is said, it was repealed. The Editor of the collection alluded to above was Richard Grafton.

The invention of the stocking-loom is thus recorded in the inscription to an old painting of one in the Stocking-Weavers' Hall, in London :—" In the year 1589, the ingenious William Lee, Master of Arts of St. John's College, Cambridge, devised this profitable art for stockings (but being despised went to France), yet of iron to himself, but to us and others of gold : in memory of whom this is here painted." In the picture Lee is represented pointing out the loom to a female knitter who is standing near him, and there is a story of his having invented the machine to facilitate the labour of knitting in consequence of his falling in love with a young country girl, who, during his visits, was more attentive to her needle than to his proposals.

Lee, it seems, was a native of Woodborough, in Nottinghamshire, and he established his loom at Calverton, a village within a few miles of the county town, where he for some years carried on business. But meeting with no encouragement from Queen Elizabeth, to whom he applied for aid, and being, through the narrow commercial policy of the times, rather discountenanced in his undertaking, he accepted an offer from Henry IV. of France, and went with nine of his journeymen to Rouen, where he fixed his manufactory with equal credit and advantage. Henry, however, being, shortly afterwards assassinated, and civil commotions having arisen on his death, Lee was again neglected, and died in great distress at Paris. Seven of his workmen returned to England, and these, together with one Aston, who had been an apprentice to Lee, and was for some time a miller at Thoroton, laid the foundation of the stocking manufactory in this country, where it increased so rapidly, in the course of fifty years, that the masters were incorporated by letters patent in 1663, and it has since become one of the staple branches of our trade.

In the petition for the patent, the machine is described as consisting of two thousand parts, and making, almost instantaneously, two hundred meshes; yet so ingeniously contrived, that this can be performed without either much skill or labour on the part of the weaver: the work performed by it is, technically, termed framework-knitting. The residence of Lee at Rouen has afforded the French a pretext for claiming the credit of this invention; but without the shadow of any real title. Unlike many great discoveries, it cannot be attributed to accident, but must have been the result of genius and deep reflection, and confers the highest honor on the memory of the inventor.

THREAD-LACE.

MODERN MODE OF KNITTING LACE;—POINT; BLONDE;—ANCIENT WORKED LACE;—INVENTION OF KNIT LACE;—ESTABLISHMENT OF THE LACE MANUFACTORY;—BRITISH LACE.

HALF a century ago, when a knowledge of many useful as well as ingenious arts formed part of the education of females in genteel life, it might have been considered superfluous, at least, if not absurd, to have offered any explanation of the mode of making lace; but as these have been superseded by other accomplishments, it is probable that they who are now the greatest consumers of lace are those least acquainted with the manner in which it is produced.

Thread-lace is not—technically speaking—woven: it has neither warp nor woof, but is rather knit somewhat in the manner of stockings; except that in making these, only one thread is employed, and that in one uniform way, whereas lace is formed of as many threads as the pattern and breadth require, and disposed in such manner as that it may exhibit a diversity of figures. In order to knit lace, the pattern is drawn on a piece of parchment, and fastened to the cushion of a circular box with pins formed on purpose, which are stuck through it in various places, according to the design intended to be represented; the requisite number of threads are then wound upon small bobbins, one end being tied to each pin, and these are thrown over and under each other in various ways; so that the threads twine round the pins, and thus form that multiplicity of holes or eyes which produce the desired figure. Much art is not required in this operation, and it is far from being so ingenious an invention as that of weaving stockings in a loom. It is, however, extremely tedious; and when the thread is fine, and the pattern complex, it requires more patient attention than young ladies of the present day choose to bestow upon it: it has, therefore, been abandoned to indigent females, who by their industry, and skill in the finer branches, thus raise the price of materials of small original cost to a higher value than in any other manufactory whatever, except perhaps some of those established at Birmingham, for the different fabrications of steel.*

When knit-lace has been worked with the needle, or embroidered, it is then termed *point*, the price of which is excessive; and when formed of silk, it is called *blonde*.

The antiquity of this art cannot be determined with precision: no passage in the Greek or Latin authors has any direct reference to it; and although some commentators consider the borders sewn upon the vestments of the Hebrews and the Phrygian work of the Romans, as lace, yet they would rather appear to have been some curious embroidery, the apparent ingenuity of which was probably magnified by its scarcity. Many authors mention that it was invented in modern Italy; but this seems rather to allude to that kind made wholly with the needle, which is, doubtless, of much greater antiquity than that made by knitting. Lace of that kind is still to be found, on the continent, among old church furniture; but the process of making it is so slow, that it was probably confined to convents, and to ladies of fortune, who had little other employment for their time.

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* "*Steel.*" It has been calculated, that a piece of steel, of the value of *five shillings*, may, by the mere operation of labour, be manufactured into as many watch-springs as would be worth *thirty thousand pounds*,

Knit-lace is supposed, with much appearance of probability, to have been a German invention; discovered, about the year 1561, at St. Annaberg, in Saxony. The person to whom the ladies are indebted for this elegant appendage to their dress is said to have been a female; and we take pleasure in recording the fact, both in honor of the sex, and as a tribute to the memory of the inventress, Barbara Uttmann. From Saxony the art speedily found its way to the Netherlands, and it was from Brussels that it was introduced into France, during the administration of the celebrated Colbert, in 1666. It was there, at first, confined to point-lace; and there was an exclusive privilege granted to a Madame Du Mont and her four daughters, who established a manufactory in Paris, in which, within a short period afterwards, more than two hundred women found employment.

In this country, the manufacture of lace was slowly established; and, until within these few years, was far from keeping pace in improvement with other branches of our national industry. Prejudice, indeed, still gives the preference to foreign lace, although its superiority in the eyes of our modern belles may be fairly attributed rather to the excess of its price than of its real value; for, it is a singular fact, that, at a recent trial in the Court of Exchequer respecting some smuggled French lace, some of our most eminent dealers declared, upon their oaths, *that they could not distinguish the difference between it and that manufactured in England.*

VANES.

EARLIEST DISTINCTION OF THE WINDS;—DIVISION OF THE THIRTY-TWO POINTS;—TEMPLE OF THE WINDS AT ATHENS;—COLUMN AT CONSTANTINOPLE;—APPARATUS OF VARRO;—WEATHERCOCKS;—SHIP-VANES.

In the infancy of navigation, mankind had no particular names for distinguishing the principal winds, because for a long time they never ventured to go out of sight of the shore, and therefore had but little occasion to observe their course.

At first, names were only assigned to the four principal winds, which is most naturally accounted for by observing that the sun at noon stands always over one point of the horizon, which is called the meridian or south, and that directly opposite the north. If a person place himself with his face to the north, he will have the east on his right, and the west on his left. Names were therefore first given to these four points, which were afterwards increased to eight in the time of Aristotle; but it is partly proved by a passage in Homer, where he intends to mention all the winds, but only enumerates four, that when he wrote, these only were distinguished. In the time of Vitruvius, twenty-four points were distinguished, though this division was but little used. The antiquity of the division into thirty-two points has not been determined. Some authors are of opinion that it has only been in use since the time of Charles the Great, but it has since been acknowledged to be of much greater antiquity. However, it is to be remarked, that in his time the ingenious method of denoting all the winds by the names and combinations of the four principal winds, was first adopted.

It is certain that vanes for ascertaining the direction of the wind were invented at a very early period; but the information given by Vitruvius respecting the tower built at Athens, by Andronicus Cyrrhestes, is the most ancient concerning any mode of observing the direction of the winds, and the earliest with which we are acquainted. This tower was built in the form of an octagon, on each side of which was carved an allegorical representation of the wind to which it was opposed, and the name was written above in large characters. On the summit was a copper triton, which pointed with a rod to that point from which the wind blew. The tower is standing, and the pedestal on which the triton was placed is still observable.

A pyramidal column, probably octagonal, on the summit of which was placed a female figure, made to turn with every wind, was certainly erected at Constantinople, the use of which appears to have been unknown to the Greeks. According to Cedrenus, this pillar was erected by Theodosius the Great; others ascribe it to Leo Isauricus. Were the first supposition correct, it would belong to the fourth century, and, in the second case only to the eighth; but it was probably constructed prior to the time of Theodosius. The female figure is called *Anemodoulon*, by Nicetus; by Cedrenus, *Anemoderion;* the former denotes a person belonging to the wind, the latter one who contends with the wind.

Varro describes an apparatus at his farm, similar to that in use in many modern buildings, for ascertaining the state of the wind without examining it in the open air. Within the building was a circle in which the winds were represented, and an index, like that of a clock, pointed to the wind that blew.

In an account written before the year 1151, mention is made of a tower at Hems, in Syria, formerly called Emessa, on the top of which was a copper horseman, that was turned by the wind. In Europe, the custom of placing vanes on church-steeples is very old; and as they were made in the figure of a cock, they have been thence denominated *weather-cocks*. In the dark ages of ignorance and superstition, the clergy frequently styled themselves the cocks of the Almighty, whose duty it was, like the cock which roused St. Peter, to call the people to repentance, or at all events to church, and thence the cock was considered the emblem of clerical vigilance. These weather-cocks are mentioned so early as the ninth century.

In France, in the twelfth century, noblemen alone were permitted to have vanes on their houses, and at one time, this privilege was only accorded to those who first planted their standards on the walls of a town when stormed.

The oldest information respecting vanes used on board ship, appears to be taken from the life of Emma, consort of Canute the Great, the author of which, describing the Norman fleet, sent to England in 1013, states that they had birds affixed to the tops of the masts, which indicated the direction of the wind. There is also in the cathedral of Bayeux, a piece of tapestry, representing the actions of William the Conqueror, and executed with the needle, either by his consort, or under her immediate direction, in which many of the ships are drawn with vanes at the mast-head.

WIRE-DRAWING.

EARLY MODE OF MAKING WIRE;—GOLD EMBROIDERY;—ANCIENT REMAINS OF WIRE;—INVENTION OF WIRE-DRAWING;—INTRODUCTION INTO ENGLAND;—FILIGRANE WORK;—SPANGLES.

IN early periods, metals were probably beat into thin plates, and, being afterwards divided into small slips, were rounded by a hammer and file, so as to form threads or wire. The net in which Vulcan entrapped Mars and Venus, and which was so fine that the Gods themselves are represented as unable to perceive it, was forged, as the poets tell us, on the anvil. The mantle taken from the statue of Jupiter by the tyrant Dionysius, and the tunic of Heliogabalus, described by Lampridius, were woven entirely of gold threads. This invention is ascribed by Pliny to King Attalus, but, it is more probable that Attalus first caused woollen cloth to be *embroidered* with threads of gold. In the Scriptures we also read, that when Aaron's sacerdotal dress was made, the gold was beaten and cut into threads so as to be interwoven with the cloth.*

There is not a passage to be found in any ancient author in which mention is made of metals being prepared by being wire-drawn. The *æs ductile* of Pliny was so termed because it was malleable, and works made with threads of metal are too rarely spoken of to allow us to suppose that they were formed otherwise than by the tedious process of the anvil. Very few remains of ancient wire-work have been discovered. In the museum at Portici are three metal heads, one of which has fifty locks of wire as thick as a quill, bent into the form of a curl; and a Venus, a span in height, has golden bracelets, made of wire, round the arms and legs. But the Romans must have possessed gold-wire of considerable fineness, as mention is made of its being used by their surgeons in fastening false teeth.

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* Exodus, ch. xxxix. v. 3.

The invention of wire-drawing may probably be classed among those of the fourteenth century, as in the History of Augsburg in 1351, and in that of Nuremberg in 1360, wire-smiths were called wire-drawers and wire-millers.

The finer kinds of work, especially in gold and silver, were best executed for a long time in France and Germany. A Frenchman, named Anthony Fournier, in 1570, brought the art of drawing very fine wire to Nuremberg, whither an artist of the name of Held also repaired from France, in 1592, and received an exclusive patent for his manufactory for fifteen years, which term was afterwards doubled. His patent also, by a grant from the Emperor Rudolphus II., 19th March 1608, included the manufacture of copper gilt with gold or silver. In 1612 his patent was renewed for fifteen years more by the Emperor Matthias, and, in 1622, was converted into a fief to the heirs male of the family of Held. All the wire made in England was manufactured by hand until the year 1565 when the art of drawing it with mills was introduced by some foreigners. Some say that Jacob Momma and Daniel Demetrius, first established wire-making at Esher; and Anderson says, that the first flatting-mill was erected at Sheen, near Richmond, in 1663, by a Dutchman.

The machine for flattening wire to be spun round thread consists of two steel cylinders, moved by a handle, which compress the wire as it passes through them. The greatest improvement ever made in this art, was a machine driven by water, the axletree of which, by means of a lever, moves a pair of pincers, that open as they touch the drawing-plate, lay hold of the wire as it passes through a hole in the plate, and draw the wire back with them; but the inventor and the period of its invention are unknown: it has been ascribed to a man of the name of Rudolf, at Nuremberg, but this supposition is unfounded.

Filigrane works are of great antiquity, and appear to have been brought to Europe from the East. It was much used in church ornaments in the middle ages, and there was formerly preserved in an abbey at Paris, a cross, ornamented with filigrane work, made by St. Eloy, who died in 665. Maria Euph. Reinhard, a female artist at Augsburg, who died in 1779, was celebrated for this kind of work.

Spangles are made by first twisting wire round a rod into the form of a screw; it is afterwards cut into single spiral rings, which are then placed on a smooth anvil and flattened by a smart blow of a hammer, so that a small hole remains in the middle, and the ends of the wire, which lie over each other, are closely united. They were first made in France, and from thence introduced into Germany, where they began to be manufactured in the beginning of the seventeenth century; but the invention is still older, as spangles, though of a coarse kind, are found on ancient horse-furniture, long prior to that period.

WOOLLEN MANUFACTURE.

EARLIEST MODE OF DRESS; — SHEEP; — SPINNING AND WEAVING;—ANTIQUITY OF THE WOOLLEN MANUFACTURE;—ROMAN MANUFACTORY;—DATE OF THE MANUFACTURE, IN ENGLAND; AND IN IRELAND;—FULLER'S AND CLOTHIER'S GUILDS;—WOAD;—YARN.

WHILE mankind lived under the shade of their native palm-trees in the tropical region, where tradition has placed their origin, they had but little occasion to provide either food or clothing: the earth spontaneously supplied the former, and the warmth rendered the latter superfluous. But in proportion as they removed from their early abode, provisions became more scarce, and the climate more rigorous; and men then had recourse to the cruelty of killing animals, both to devour them as food, and to employ their skins as a shelter against the severity of the weather.

Sheep came originally from Africa; but in that country the animal bears hair instead of wool, and it is only in colder climates that its covering gradually acquires a woolly texture. It may also be imagined that many centuries must have elapsed before sheep could have been conveyed to the northern counties, and before the inhabitants—thinly scattered, subsisting by the chace, and surrounded as they were by immense forests that produced in abundance all those animals which supplied the finest furs—could have been reduced to the necessity of employing artificial means to supply themselves with clothing. The northern tribes therefore continued to dress themselves in skins until a very late period of ancient history, and for ages after the arts of civilized life had been introduced among the inhabitants of the south.

The origin of the arts of spinning and weaving is lost in the obscurity of fable. The Egyptians ascribe the invention to their Isis, and the Hindoos trace it to the remotest period of their fabulous history; but this applies only to cotton and flax, for in those countries, as we have already mentioned, wool is not produced. Varro says, that the sheep was introduced into Greece by Hercules, and it is probable that the first attempts to manufacture wool, in Europe, were made by the Athenians. Among both the Greeks and Romans, spinning was the chief employment of the women; the rites of marriage directed their attention to it; and the distaff and the fleece were not only the emblems but the objects of the most important domestic duties of a wife. The machinery employed in weaving, though perhaps rude in its construction, was, in principle, similar to that still in use; and the process of fulling and preparing the cloth seems to have resembled the modern practice in every material point, except that of shearing the nap, with which the ancients do not appear to have been acquainted. The chief seat of the Roman manufacture was at Padua, and that city still retains a portion of its ancient celebrity for the superiority of its workmen. It is worthy of remark that, although, at a late period of the Roman commonwealth, the domestic manufacture of wool was abandoned to persons who made that their sole employment, and that it must have been carried on to a vast extent, in order to supply the wants of an immense population clothed almost exclusively in woollen, yet we no where read of cloth being measured; and it would appear that this arose from a custom of weaving no more cloth in one piece than was sufficient to form a single dress.

English historians generally attribute the establishment of the woollen manufacture in this country to the reign of Edward III.; but it has been ascertained by the ancient records of the Exchequer, that there were several guild fraternities of weavers established in various parts of the kingdom so early as the middle of the twelfth century. Thus we find it mentioned that in 1140, the weavers of Oxford pay a mark of gold for their gold:—

"The weavers of London, for their gild, £xvi.

"The weavers of Winchester one mark of gold, to have their customs and liberties, and right to elect the aldermen of their gold." And

"The fullers of Winchester £vi. for their gild."

These notices indicate, that fraternities of weavers were not only at that time common in England, but that the manufacture of cloth must have been of considerable extent and antiquity when it had given rise to guilds established by law.

In farther confirmation of the great antiquity of the art of weaving in England, Gervase of Canterbury, who wrote about the year 1202, says, in his Chronicle; (col. 1349,) when speaking of the inhabitants of Britain, that "*the art of weaving* seemed to be a peculiar gift bestowed upon them by nature." Thus it appears, that, at a period long prior to that which modern historians assign as the time when the woollen manufacture was introduced into Britain, it was an art that had been so long practised, as to be reckoned by its own inhabitants almost indigenous of the soil.

Sir Matthew Hale enables us, in some measure, to account for the origin of the modern idea on this head. For he remarks that "in the time of Henry the Second, and Richard I. this kingdom greatly flourished in the art of manufacturing *woollen cloth;* but, by the troublesome wars in the time of King John and Henry III., and also Edward I. and Edward II., this manufacture was wholly lost, and all our trade ran in wools, and wool-fells and leather."

It is needless to observe, that a manufacture of such indispensable utility could not, in such a short period, be wholly lost in a country where it was once known. All that can be inferred from this expression is, that it declined very much; so as, in a great measure, to interrupt the foreign trade in cloth, which seems to have been a principal article of export from this kingdom at that early period. Edward III. restored this decayed manufacture, and hence he has come to be accounted the founder of it in England.

The above remark of Sir Matthew Hale perfectly agrees with the Magna Charta of Henry III., and there is an ordinance respecting the exportation of cloths, &c. by Edward I.

The richness and comparative importance of the fraternity of weavers, in the period here alluded to, may be guessed at from the following circumstances;—

"Anno 1159. The weavers of London stand charged with iij marks of gold for the farm of their gild for two years; the bakers of ditto with one mark and vj ounces of gold."

"1164. The weavers of London rendered £xij per annum for the farm of the gild; the bakers of ditto £vj per annum."*

In both these cases the weavers pay double of what is exacted from the bakers; hence it seems reasonable to infer that they were by much the richest fraternity of the two.

"1189. The fullers of Winchester pay ten marks for a confirmation of their privileges."† From this it appears that the fullers of Winchester still continued (as in the year 1140) a powerful fraternity.

That the business of dyeing was also carried on in these days as a separate, honourable, and profitable employment, may be inferred from the following record:—

"Anno 1201. David, the dyer, pays one mark that his manor may be made a burggage."

At this early period, woad seems to have been very much employed as a material for dyeing. This plant was cultivated in Britain before the days of Julius Cæsar; and probably the cultivation of it would be much extended, as it came to be more demanded for the woollen manufacture in later periods; but this extended culture could not supply the increasing demand for this drug, insomuch that it was, for a great many ages, a constant article of import, as the following instance, among many others, fully shews:—

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* Madox, Hist. Exch. p. 231. † Ib. p. 274.

"Anno 1213. The following sums were accounted for by sundries as customs for woad imported, *viz.*

In Kent and Sussex (Dover excepted)	£103	13	3
Yorkshire	98	13	4
London...........................	17	13	4
Norfolk and Suffolk	53	6	0
Southampton	72	1	10
Essex	4	2	4."

In all these places, therefore, the woollen manufacture seems to have been carried on to a great extent.

Many other anecdotes might be picked up in confirmation of this remark; among which are the following:—

"1140. The men of Worcester pay c. shillings, that they may buy and sell dyed cloth, as they were wont to do in the time of King Henry I." There is not the smallest reason to think that this was foreign dyed cloth, but British cloth, as alluded to in the ordinance of Edward I., already quoted, 1284.

"1225. The weavers of Oxford pay a cask of wine, that they may have the same privileges they enjoyed in the days of King Richard and King John."

"1297. The aulnager of cloth was displaced, and his office given by the King to another." The aulnager was a public officer to inspect cloths, so as to see that they were truly made according to statute. This indicates a very advanced state in the manufacture.

From these, and many other circumstances of the same kind that may be collected, there can be no room to doubt that the woollen manufacture was carried on as a great national object for several ages before the time of Edward III., at which period, our historians usually assert, that it was first introduced into England. And it was probably owing to the interruption it met with during the troublous reigns of John and his immediate successors, that the manufacture came to be so firmly established in the Netherlands, as to obtain a superiority over the woollen manufacture of Britain, which it retained for many ages. It was also probably owing to this superiority that our forefathers lost the knowledge of many branches of this manufacture, which it is evident they once possessed; of this kind especially may be reckoned the art of dyeing and dressing cloths, which art was only revived in Britain at a very modern period.

If our historians have been thus mistaken with regard to the manufactures of Britain, it will not appear surprising that they should fall into similar mistakes in regard to the manufactures of Ireland. It is generally believed that the woollen manufacture was introduced into this last country at no very distant period; and in Anderson's History of Commerce, we find the first dawnings of it marked under the year 1376. But that woollen cloth was manufactured in that country a long time before that period, is evident, from the following curious anecdote preserved by Madox:

" In the reign of Henry III. (*i. e.* between

1216 and 1272,) Walter Blowberne accused Haman le Starre of a robbery, &c. whereof the said Haman had for his share two coats, *viz.* one of *Irish Cloth*, &c."* Irish cloth was, therefore, known in England at that period, which is at least one hundred years prior to that mentioned in the History of Commerce.

Although it is still doubtful whether the poems attributed to Rowley, a priest in the reign of Henry IV., are spurious or not, yet, as there has not yet appeared any irrefragable proofs that they are not genuine, a circumstance that occurs in them relating to this subject may be noticed as deserving some degree of attention.

This author points out Lincoln as being a place then noted for its fine woollen manufacture; for the dress of the Abbot of St. Godwin's, who is represented as living in great pomp, is thus described :—

> " His cope (cloak) was all of Lyncoln clothe so fyne,
> With a gold button fasten'd near his chyne,
> His autremete (a loose priest's robe) was edged with
> golden twynne," &c.
>
> *Ballad of Charitie*, 50.

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* Hist. Excheq. p. 381.

In confirmation of this anecdote, it appears, from many particulars preserved in Hackluyt's collection, that, about this time, a very considerable trade in cloth was carried on between Boston—the port of Lincoln—and Prussia, and other places in the Baltic; and most readers of ancient poetry will recollect the frequent mention of *Lincoln green*, in the descriptions of ancient dress.

The following instances will serve to shew the degree of perfection to which the spinning of woollen yarn has been brought, within the last century.

In the year 1745, a woman named Mary Powlis, of East Dereham, in Norfolk, spun a single pound of wool into a thread of eighty-four thousand yards in length, wanting only eighty yards of forty-eight English miles; which was, at that period, considered as a circumstance of sufficient curiosity to merit a place in the records of the Royal Society. Since that time, however, Miss Ives, a young lady of Norwich, has spun a pound of combed wool, into a thread of one hundred and sixty-eight thousand yards; and her wonderful success having induced her to try her talent upon cotton, she actually succeeded in producing from the same weight, a thread of two hundred and three thousand yards, equal to upwards of one hundred and fifteen English miles. It has been calculated that this last thread, if woven, would produce about twenty yards of yard-wide muslin: but it is said that even this extraordinary effort of ingenuity has been exceeded by an Irish flax-spinner in the county of Antrim.

WRITING-PENS.

ANCIENT MODE OF WRITING;—PAPYRUS;—CALAMUS;—REEDS;—ANECDOTES OF THEODORIC, KING OF THE GOTHS, AND OF THE ROMAN EMPEROR JUSTIN;—ANCIENT MS. COPY OF VIRGIL;—QUILLS;—GEOMETRIC PEN;—DRAWING AND MATHEMATICAL INSTRUMENTS.

The ancients were unacquainted with the fitness of quills for the purposes of writing. They chiefly employed tablets covered with wax, on which they engraved the characters with a metal style; and when they wrote with liquids on parchment, or on the paper then manufactured from the Egyptian papyrus, they made use of reeds.

It is singular, that notwithstanding the places where these reeds grew wild have been accurately designated, and the probability that they are still to be found in the same situations, we are yet wholly ignorant of the species to which they belong. The authors who have treated on the subject have contented themselves with informing us, that they were formed of the *calamus:* but the genus of plants known to the ancients by that name is too numerous to allow of our determining it with any approach to certainty. The most beautiful of the kind grew in Egypt, in the district of Gnidus, in Asia Minor; in Armenia; and in some parts of Italy. Botanists have, indeed, explored these places, and learned conjectures have been formed respecting the particular class to which it should be assigned; but with so little success, that it has not found a place in the botanical system of Linnæus.

It is also remarkable, that reeds are still employed to write with by many of the eastern nations. We learn from the voyages of Chardin, Tournefort, and others, that these are small hard canes about the size of large swan-quills, which they cut and split in the same manner that we do quills, except that they give them a much longer nib. The best are collected in some places bordering on the Persian Gulph, whence they are sent throughout the East. They are deposited, for some months after they are cut, under a dunghill, where they assume a mixed black and yellow colour, with a fine polish, and become hard; but the latter quality is accompanied with a want of elasticity which deprives them of the most material advantage of our pens; and it has been not unaptly remarked, "that had the ancients been acquainted with the art of employing quills for this purpose, they would probably have dedicated to Minerva, not the owl but the goose."

It has been supposed, that quills were made use of for writing so early as the fifth century; but the conjecture rests merely upon an anecdote of Theodoric, king of the Ostrogoths; who, being so illiterate that he could not write even the initials of his name, was provided with a plate of gold, through which the letters THEOD. were cut, and this being placed on the paper, when his signature was required, he traced the letters *with a quill.* A similar method was employed by the Roman Emperor Justin, who reigned at a somewhat later period; and it is remarkable, that in an age not destitute of learning, two nearly contemporary monarchs, whose talents had raised them to the throne, had never been instructed in the knowledge of the alphabet. Of more importance is the fact, that the Medicean library contains a manuscript copy of Virgil, written early in the fifth century, in which the gradual fineness of the hair strokes would lead to the conclusion, that it must have been written at least with some instrument as elastic as a quill; but it is unaccompanied by any further proof.

The earliest certain account of the modern writing-pens dates no farther back than 636; and the next occurs towards the latter end of the same century, in a Latin sonnet to a Pen, composed by Adhelmus, a Saxon author, and the first of his nation who wrote in that language. After that period, there are numerous proofs of their having been generally known; but they were so far from having, at once, superseded the use of reeds, that persons well versed in the comparison of ancient manuscripts affirm, that the latter were commonly used in the eighth century.

Even at a later date, the papal acts, and those of the synods, were written with them; and even the use of the metal styles and waxen tablets was not entirely abandoned until the commencement of the fourteenth century. Quills, indeed, would appear to have been for a long time as scarce as reeds are at present, if we accept the testimony of the monk Ambrosius, who, in a letter accompanying a present of quills, sent from Venice in 1433, thus expresses himself: "show the bundle to brother Nicholas, *that he may select a quill.*"

Pens could not, with propriety, be ranked among the mechanical inventions, were it not for the variety of ingenious improvements that have been made in metallic pens, for facilitating both writing and drawing. Among these the geometric pen is by far the most curious. By this small machine, a right line, a circle, an ellipse, and other mathematical figures may be described. It was invented by John Baptist Suardi, who wrote a treatise on the subject; for although several writers had observed the curves arising from the compound motion of two circles moving round each other, Suardi was the first to realize the principle, and to reduce it into practice. The number of curves this instrument can describe, the inventor enumerates at 1273, which, he says, can all be delineated in the simple form.

The fountain-pen which supplies itself with ink; the port-crayon, and other drawing and mathematical instruments known under the denomination of pens, as well as the penna duplex, for making a double copy of any writing at one time, are all too well known to require description.

BOOK IV.

ON

DISCOVERIES

IN

SCIENCE.

ADULTERATION OF WINE.

VINOUS AND ACETOUS FERMENTATION;—SUGAR OF LEAD; ANTIQUITY OF THE ADULTERATION OF WINE;—SULPHUR;—LITHARGE;—SEA-WATER;—MUSTO COTTO;—STUM-WINE;—MODERN ADULTERATIONS.

THE writings of a celebrated chymist* of the present day, have led the public to suspect that few articles of daily consumption, in London, escape adulteration. In no instance, perhaps, has it been more extensively practised, throughout Europe, or with consequences more prejudicial to health, than in that of wine.

The juice of the grape, when expressed, is subject to two distinct degrees of fermentation—the vinous, and the acetous: by the first it becomes wine; but the progress from that to the second, by which it loses its spirit and becomes combined with acid, is almost imperceptible, and, when the liquor is weak, is frequently rapid. The progress of the vinous fermentation, if properly attended to, may, indeed, be checked; but once the acetous fermentation has commenced, it is impossible to restore the wine to its original state. Ingenuity, however, has been variously exerted to render the acid in wine, thus spoiled, imperceptible; so that, they who do not possess an accurate judgment in such matters not unfrequently purchase sweetened vinegar in lieu of wine. Were this the only consequence of the fraud, it would not form a subject for serious alarm; but as mere saccharine juices cannot be used in sufficient quantity to conceal the acidity without betraying themselves, the dealers have had recourse to another expedient, more certain in its operation, and more injurious to the consumer.

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* Accum, on Culinary Poisons.

The substance thus employed is sugar of lead (*saccharum saturni*), which, when dissolved in the acid that spoils wine, gives to the liquor a saccharine taste that is not unpleasant, without affecting either the colour or smell, while it effectually stops the fermentation; but it communicates, at the same time, the noxious quality of occasioning, according to the quantity used and the constitution of the consumer, violent cholics, obstructions, and other diseases, which sometimes end in death; so that, as Beckmann observes, it may be justly doubted, whether Mars, Venus, or Saturn is most destructive to the human race. It is, however, consolatory to reflect, that the strength of the wine usually imported into this country, secures it in a great measure from acidity, and consequently renders this practice less frequent than on the Continent; but there, it is very generally employed *to correct,* as it is termed, the small wine in most common use, and no where more extensively than at Paris.

It would appear that the ancients were aware that lead both ameliorated harsh wine, and preserved it from acidity, and that the acid of wine had the power of dissolving it; for when the Greek and Rome wine-merchants wanted to know whether their wine was spoiled, they immersed in it a plate of lead, which could only be to observe whether the colour of the lead was changed by corrosion. They were also acquainted with a mode of improving and clarifying wine by boiling it with lime, or gypsum; which method is supposed to be still practised in some parts of Spain, and in the island of Zante: but is considered no farther prejudicial than as it tends, if used in too large a quantity, to deprive the liquor of its spirituous parts. That the custom is of very ancient date in the former country, is proved by a decree of the States of Arragon, in 1348, prohibiting its use.

The practice of adulterating wine is, indeed, almost as old as the liquor itself; and so invariably has it been continued, that every age of which we possess the records furnishes some edicts against its continuance. Some of these enumerate the articles used for that purpose, among which we find vitriol, quicksilver, lapis caliminaris, and sulphur: the latter, however, is certainly innoxious, and is supposed to be much used in the preparation of some qualities of white wine, at Bordeaux. The mode in which it is employed, is that of fumigation, by kindling linen rags dipped in melted brimstone, and allowing the vapour to enter the cask; and its effects are, to confine the fixed air contained in the wine, and to stop its fermentation. Some wine-merchants, however, sprinkle these rags with bismuth, which, should it fall into the liquor, may have a very prejudicial effect on the health. It was indeed, at one time, supposed to have been attended with such baneful consequences, that its use, and that of litharge, had nearly ruined the wine-trade of Wurtemberg; and, in 1697, this species of adulteration was forbidden throughout that kingdom, on pain of death. It was not, however, until one extensive dealer had been beheaded, and others severely fined, that the practice was checked, and although it has since been concealed with more caution, it undoubtedly is not annihilated; for even in this country, and in the present century, a treatise has been published on the art of making wine, in which the use of litharge is openly recommended as being entirely free from danger.

The presence of metals in wine may be detected by the application of arsenical liver of sulphur; but its use is not decisive of the particular kind employed, as it precipitates all metals black without any distinction: and if gypsum should have been added, the colour of the precipitate will be altered by that of the earth.

Among the innocent articles with which wine has been mixed, we find mustard and mugwort mentioned, in the year 1484, and, in the following century, milk was included in an imperial ordinance against adulteration. The effects of the latter, however, are only to clarify the liquor, and to render the tint more pale, and are otherwise wholly imperceptible: it was known to the ancient Grecians; and is still used in small quantity, and for white wine alone. But the most extraordinary addition of all was employed by that people, not to adulterate but to ameliorate their wine; for which purpose, we are assured by many old authors that they sometimes mixed it with sea-water.

The Greeks and Romans used also to boil much of their wine until only a certain portion of it remained; and when by this operation it was deprived of some of its watery particles, it was mixed with honey and spices. This method, with the exception of the mixture of spice and honey, is still applied to some kinds of new wine in Italy; where it is now, however, only used for salad and sauces, under the name of *musto cotto.* It is said, to be also employed in the preparation of the Spanish and Hungarian sweet wines; but the fact is exposed to considerable doubt.

There is, also, another mode of preparing wine, which cannot properly be called adulteration, but which was formerly considered so unwholesome as to have been prohibited in Germany, in 1472. It is effected by stopping the fermentation at a certain period, by which the original sweetness of the grape is in great part retained, and on being exposed to the air, the fermentation recommences. The prejudice against this method no longer exists, and it is frequently employed in Germany and France: the common appellation of wine thus treated, is *stum wine;* but the French, who prepare considerable quantities in this manner, at Bordeaux, denominate it *vin en rage*.

Mr. Accum tells us that in London "Brazil wood, or the husks of elder-berries and bilberries are employed to impart a deep rich purple tint to red port of a pale, faint colour; that gypsum is used to render cloudy white wine transparent; that an additional astringency is imparted to immature red wines by means of oak-wood, saw-dust, and the husks of filberts; and that a mixture of spoiled foreign and home-made wines is converted into the wretched compound frequently sold as genuine old port. Various expedients are resorted to for the purpose of communicating particular flavour to insipid wines. Thus a nutty flavour is produced by bitter almonds; and the ingredients employed to form the *bouquet* of high-flavoured wines, are sweet-briar, orris-root, clary, cherry-laurel-water, and elder flowers."

"There is in this city," he says, "a certain fraternity of chemical operators, who work under ground in holes, caverns, and dark retirements, to conceal their mysteries from the eyes and observation of mankind.

These subterraneous philosophers are daily employed in the transmutation of liquors, and by the power of magical drugs and incantations, raising under the streets of London the choicest products of the hills and valleys of France. They can squeeze claret out of the sloe, and draw champagne from an apple; an art which Virgil seems to have had in view in that remarkable prophecy,—"

"*Incultisque rubens pendebit sentibus uva.*"
Eclog. iv. v. 29.

"The ripening grape shall hang on every thorn."
Dryden.

ALUM.

ROMAN ALUMEN;—MODERN ALUM;—USES;—DISCOVERY; ANCIENT ALUM WORKS;—MINES AT CIVITA VECCHIA; JOHN DE CASTRO;—MONOPOLY OF THE POPES;—ENGLISH ALUM WORKS;—ROMAN ALUM.

It has been generally supposed that the substance which the Romans termed *alumen* was the same as that distinguished by us under the denomination of alum: but this affords an instance how frequently names are improperly applied without sufficient examination.

The ancients were certainly unacquainted with the crystallized alum of the moderns; and what they called *alumen* was, in fact, nothing else than that species of impure vitriol so frequently found in mines, and which is often little more than vitriolic earth. Pliny, indeed, speaks of blue vitriol being obtained in Spain by the process of boiling; but he mentions the circumstance as singular, and no trace of any other works for the preparation of either vitriol or alum is to be found. Neither the Greeks nor Romans, indeed, speak of any other than natural alum, and every thing related by them coincides with the description of natural vitriolic substances, while alum is seldom produced spontaneously in the earth, and some acute mineralogists even deny the existence of natural alum.*

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* Tournefort thus mentions a substance of this kind, which he discovered in some caves in the island of Milo, in the Levant, which place was celebrated for its alum in the time of Diodorus Siculus, and Pliny. " They are vaults of about four or five feet in height, incrusted with alum nearly throughout. This alum is formed in flat laminated pieces of about an inch in thickness. The solution of this natural alum is sourish and styptic ; it ferments and coagulates oil of Tartar in the same manner as purified alum, from which it only differs by containing a larger portion of stony matter. The quill alum, which is also found there, possesses the same properties. It is found in large pacquets composed of threads as slender as the finest silk, of a shining silver colour, and from one to two inches in length."

Voyage au Levant, tom. i. p. 63., ed. 1718.

The close affinity between the two substances has led to the error: they are both neutral salts; both are, from their astringent qualities, comprehended under the common description of styptic salts; and they contain an acid which is, in each, called vitriolic. They can also be generally employed for similar purposes; they are usually found in the same places; and the only essential difference is, that vitriol is combined with metallic earth, of either copper, zinc, or iron, and alum with a peculiar white earth which bears its name.

It is, however, true, that the vitriolic mineral earths will sometimes produce alum, or at least that where these abound, there are usually other mineral earths, from which alum can be obtained; but this is a modern discovery, and is due to a chemical process with which the ancients were not acquainted.

One of the chief uses of alum is to fix the colours used in dyeing, and to render them more brilliant: for this purpose the natural *alumen* was also employed; but it fell into disuse when the modern invention was made known, and to this latter the name of alum was then distinctively applied. Real vitriol, however, maintains a superiority in some medicinal qualities, and in the process of dyeing black.

Of late years, a preparation of alum has been recommended as a security against the destructive consequences of fire, and this has been generally considered as a novel application of its powers. But an inquiry into the uses to which the ancients applied their *alumen*, shows that it was employed for the same purpose, and in a similar manner; for we learn from Gellius, that Archelaus, a general in the service of Mithridates, washed over a wooden tower with a solution of it, and this rendered it so impervious to fire, that all Sylla's attempts to set it in flames proved ineffectual. A similar instance is also recorded by Ammianus Marcellinus.*

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* These curious passages are as follow:—

"Tum Sulla conatus est et tempore magno eduxit copias, ut Archelai turrim unam, quam ille interposuit, ligneam incenderet. Venit, accessit, ligna subdidit, submovit Græcos, ignem admovit; satis sunt diu conati, nunquam quiverunt incendere; ita Archelaus omnem materiam obleverat alumine.

It has, indeed, been conjectured that the substance employed on these occasions was not *alumen*, but *asbestos*, which has been sometimes confounded with atlas-vitriol; but the difficulty of covering a building with the threads of this fossil, and its being soluble in water, render this supposition incredible.

The origin of our present alum seems to have taken its rise in the East; and the period of the invention, though not exactly ascertained, was certainly subsequent to the twelfth century. Its use in the art of dyeing first brought it into notice: this application of it was, therefore, also learned from the Orientals, who, notwithstanding the advantages which the Europeans possess in the

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Quod Sulla atque milites mirabantur, et postquam non succendit, reduxit copias."

Aul. Gell. Noct. Att., lib. xv. cap. 12.

" Persæ aggerum altitudine jam in sublime porrecta, machinæque ingentis horrore perculsi, quam minores quoque sequebantur, omnes exurere vi maxima nitebantur; et assidue malleolos atque incendiaria tela torquentes laborabant incassum; ea re quod humectis scortis et centonibus erant opertæ materiæ plures, aliæ unctæ alumine diligenter, ut ignis per eas laberetur innoxius."

Amm. Marcel., lib. xx. cap. 12.

modern improvements in chemistry, still retain a superiority in the beauty and durability of some of their colours. The earliest of these alum works are said to have been established at a place called *Rocca*, in Syria, the exact position of which it is now difficult to determine; but it is probable that it was either Rocca on the Euphrates, or Edessa in Mesopotamia, which is also sometimes called *Roccha*. The point, however, is of no further importance, than as it is by many supposed that the common name of *roch-alum* was thence derived, and not, as others think, from *alun-de-roche*, or *rock-alum*, from this substance being sometimes obtained by the process of boiling mineral stones. Towards the middle of the fourteenth century, there were alum works in the neighbourhood of Constantinople, at Trebizond, and in various parts of the Levant; and in the reign of the Emperor Constantine II., in the following century, there was a celebrated manufactory at Foya Nova, in the vicinity of Smyrna, from which this country and the greatest part of Europe was then supplied. Of the latter a description has been recorded by Ducas,* from which we learn that the stones found on the neighbouring mountains were calcined and reduced to a powder, which was afterwards boiled until a residuum was formed, in substance like coagulated milk; this was then poured into vases, and allowed to subside during four days, at the end of which period the alum was found congealed in resplendent crystals around the edges and at the bottom of the vessels.

It seems probable that the first alum works in Europe were established about the year 1459, in the Island of Ischia, on the coast of Tuscany, by a Genoese merchant named Bartholomew Perdix, who had learned the art at Rocca; but the most ancient in existence are those still carried on in the neighbourhood of Civita Vecchia, in the Ecclesiastical States. The founder of these was John de

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* This "*Ducas*" must not be confounded with the "Theodore Ducas," whose name has been lately affixed to some amusing but fictitious travels. The work alluded to in the text is entitled *Historia Byzantina, res imperio Græcorum gestas complectens a Joannes Palæologo I. ad Mehemetem II.*

Castro, the son of a celebrated lawyer, who flourished at Padua in the beginning of the fifteenth century. He had been established as a merchant at Constantinople, where he acquired a considerable fortune by dyeing Italian cloth, which in those days was sent there expressly for that purpose; but having lost all his property when the city was taken by the Turks under Mahomet II., in 1453, he returned to his native country, and obtained the office of Commissary of the Revenues of the Apostolic Chamber. This gentleman, having observed that the grass on the mountains in the vicinity of Tolfa, in the before-mentioned district, had a peculiar colour, and that some white stones of a mineral appearance were impregnated with a saline taste, conjectured that they contained alum, and made the circumstance known to his patron Pope Pius II. But his discovery was at first looked upon as the visionary dream of an enthusiast, and it was long before the necessary experiments were made, in order to ascertain its correctness. When this, however, was proved, it was hailed as a victory over the Turks, to whom large sums were annually paid for the alum used in dyeing; and de Castro was not only rewarded with a portion of the profits, and elevated in rank, but was even considered worthy of a statue, which was accordingly erected to him, in Padua, with the inscription—"*Joanni de Castro, Aluminis inventori.*"

The large revenue which soon flowed into the Apostolic chamber from the sale of alum, induced many persons to search Italy for aluminous minerals; and, as they are found in many parts of that country, numerous works for boiling them were speedily established. The Pope, however, understood his own interest too well to allow of these being carried on; and, besides, used every means in his power to secure a monopoly by preventing foreigners from obtaining a knowledge of the process. The price, however, was gradually raised to such an exorbitant height, that the other nations of Europe again began to purchase it from the Turks; but his Holiness then called religion to his aid, and announcing that the profits of his alum were to be applied to the defence of the church, he prohibited all Christians from purchasing this drug of the infidels, under pain of excommunication. Succeeding Popes followed this pious example, and the Holy See continued in possession of its monopoly until the doctrines of Luther taught heretics no longer to dread its malediction.

In England, the first alum-works were established towards the close of the sixteenth century, and are thus mentioned in Pennant's Tour in Scotland:—" The alum-works in this country are of some antiquity; they were first discovered in the reign of Queen Elizabeth, by Sir Thomas Chaloner, who observing the trees tinged with an unusual colour, made him suspicious of its being owing to some mineral in the neighbourhood. He found out that it abounded with an aluminous salt. At that time, the English being strangers to the method of managing it, there is a tradition that Sir Thomas was obliged to seduce some workmen from the Pope's alum works near Rome, then the greatest in Europe. If one may judge from the curse which the Pope thundered out against Sir Thomas and the fugitives, he certainly was not a little enraged, for he cursed by the very form that Ernulphus has left us, and not varied a tittle from that most comprehensive of imprecations.* The first pits were near Gisborough, in Yorkshire, the seat of the Chaloners, who still flourish there, notwithstanding his Holiness's anathema." It is not a little remarkable that, since that period, the proprietors of the English works have farmed those of the Roman Pontiff, and even increased the benefit that the Holy See formerly derived from them: they employ about two hundred men; the produce is of a superior quality, and bears the highest price in the different markets of Europe, where it is well known under the denomination of *Roman alum.*

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* "*Imprecations.*" Such of our readers who may not choose to search into Ernulphus, will find the form at full length in *Tristram Shandy.*

AMALGAMATION.

PROPERTIES OF QUICKSILVER;—AMALGAM;—PERUVIAN MINES;—ALONZO BARBA.

QUICKSILVER is well known to unite very readily with almost every metal, and, when added in large quantities, to form a paste, capable of being kneaded, which is called amalgam. It is likewise of great utility in decomposing gold and silver from the earth and stones in which they are buried, as it is incapable of uniting with earth, on account of its being a metallic substance. The amalgam is squeezed through a piece of leather, which contains the gold and silver, mixed with a certain quantity of the quicksilver, which is separated from the former metals by evaporation caused by fire. Amalgam made with gold serves also to gild other metals, if rubbed over them, and afterwards heated until the quicksilver evaporate.

It is generally supposed that the use of quicksilver was first discovered in Spain about the middle of the sixteenth century; but Pliny assures us that the ancients were acquainted with amalgam, both for separating gold and silver from the particles of earth with which it is surrounded, and for gilding. Vitruvius also mentions the manner of separating gold from cloth, by fire, after it has been interwoven with it; the ancients, however, used always to lose the quicksilver by evaporation, which is now preserved by means of a retort.

The gold found in rivers is likewise separated from the sand by means of quicksilver, which method was probaby known in Germany, prior to the discovery of the mines in America, as, in the year 1582, John Michael Herberer described this operation as he saw it practised at Selz, near Strasburg, where quicksilver had been long employed for the purpose of washing gold.

Mercury was first introduced into Peru, in the year 1571, for the purpose of refining the silver found in the mines, by Pero Fernandez de Velasco, who had studied this process at the smelting-houses in Mexico, where it had been long practised. Quicksilver was found to be contained in the red earth of Peru called *limpi*,—which the Indians use for paint, but which is, in fact, native Cumabar,—by Henry Garces, who thus laid the foundation of the quicksilver mines, which were afterwards employed with such success for refining silver by Velasco.* Quicksilver was a free article of trade until this period, when it became the exclusive property of the Crown.

A work on metallurgy, and the use of quicksilver in refining gold and silver, was written by Alonzo Barba, a clergyman of the church of St. Bernard, at Potosi, in the year

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* These mines are situated in an extensive ridge of mountains, at no great distance from the city of Lima, and are called Huancavelica. Their discovery is fully related in the *Historia naturale e morale delle Indie*, of the Jesuit Acosta; a work which abounds with curious and valuable information.

1640, who has by some writers been supposed to be the inventor of amalgamation. He discovered the process by mere accident: for being desirous of fixing quicksilver, he mixed it with fine pounded silver ore, and soon found that the mercury had attracted every particle of silver to itself, which presented him with the idea of refining metals by means of quicksilver. This experiment he made in the year 1609, but he was probably unacquainted at that time with the smelting-works in America, and does not appear desirous of claiming the invention of amalgamation as practised in that country. The book, though published at that late period of the art, and notwithstanding there were many superior treatises on the same subject already published in German, was considered of such importance by the Spaniards, as containing all their metallurgic secrets, that they endeavoured to suppress it; and it actually became an object of attention to the British ambassador, who having obtained a copy, as a great rarity, commenced a translation of it into English, but only completed the first part. This version was afterwards published in London, in 1674, under the title of "*The First Book of the Art of Metals, in which is declared the manner of their Generation, and the concomitants of them; written in Spanish by Albara Alonzo Barba, translated by Edward Earl of Sandwich.*"

AQUA-FORTIS.

MINERAL ACIDS;—WATER OF NITRE;—PHILOSOPHER'S STONE;—AQUA-CHRYSULCA;—SEPARATION OF THE PRECIOUS METALS;—VAPOUR OF AQUA-FORTIS;—INTRODUCTION OF THE MODERN METHOD OF REFINING.

It is not easy to trace the earliest mention of mineral acids among the writings of the ancient chemists. They had, indeed, at a very early period, discovered various acids, the virtues of which they highly extol; but they generally endeavoured to conceal the process by which they were obtained; and either with this view, or from ignorance of the proper method of extracting them in a pure state, and of distinguishing their several qualities, their receipts are found to be so confused and contradictory, that it is frequently difficult even to conjecture to which of the known acids they refer.

The oldest intelligible account of aqua-fortis appears to occur in the writings of the Arabians, or at least in those of the pupils of Arabian chemists, amongst whom Geber seems to be the most ancient. The period at which this author wrote is, however, uncertain: some have ascribed it to the eighth or ninth century, and others, with more appearance of probability, to the twelfth. The age in which the Greek alchymist Synesius lived is also unknown; but it is apparent that he borrowed largely from the Arabians. A manuscript copy of his works was preserved in the library at Venice, from which some extracts have been published, in which mention is made, among the chemical solvents, of the *water of nitre,* which may probably be considered as aqua-fortis. The German monk Theophilus, also a very early writer, likewise speaks of a liquid which dissolved all metals; but the date of his works is equally undetermined. Some vague traces of aqua-fortis are, however, to be found in the works of the chemists of the thirteenth century: Lullius, who died at a very advanced age in 1315, is said to have produced it from saltpetre with the addition of vitriol; and Basil Valentin, at a later period, was acquainted with a process for the same purpose.*

There is an old tradition that this acid was first employed at Venice in the analysis of the noble metals; it was in use there at the period of the discovery of America, and was chiefly applied to the separation of the gold from the Spanish silver, by which operation vast wealth was acquired. Hence arose a very prevalent report that the Venetians had discovered the art of making gold; and, indeed, the gold refiners of every country were for a long time generally supposed to be in possession of the philosopher's stone. The epoch of the introduction into Venice of this manner of separating metals, instead of that by fire, as more anciently practised, is, however, as uncertain as that of its original discovery, and we only know that it is spoken of in a work, published by William Budé, in 1516, as a recent invention.† In this book its first employment in France is ascribed to one Le Cointe, a man of low extraction, who, late in the fifteenth, or early in the sixteenth century, began to separate gold from silver by means of a liquid called *Aqua Chrysulca;* and it is remarkable that, with its assistance, he could not only divide the smallest particle of gold from silver or any other metal, but even remove the gilding from vessels without injuring them; which would prove that *aqua-regia* was also then known, as without it that operation could not be performed. He could extract the silver from the finest gilt wire, so that the gold would remain in the form of a tube, and the silver being dissolved by the aqua-fortis—which in this case must have been the liquid employed,—was afterwards separated from it by another process.

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* For some account of "*Basil Valentin*," see the Art. "*Fulminating Powder.*"

† "*Budé*," De Asse, fol. lib. iii. p. 101.

By this art Le Cointe realized a large fortune; but its exercise was considered not only unhealthy but dangerous, and it is said that, when he had become rich, he used to entrust the execution of the work to a servant, whom he directed at a distance, in order to avoid the pernicious fumes arising from the effervescence of the corrosive liquor.

The vapour of aqua-fortis, or even that of saltpetre alone, is doubtless injurious to the constitution, but the danger to be apprehended has been exaggerated, probably with a view to deter people from attempting to discover the secret of the art, as well as to enhance the value of the production; and hence have, in a great measure, arisen the stories which are told of masks being used in some chemical operations, although it is evident that they can only protect the eyes, and not the lungs.*

After Le Cointe's death, his son, who it appears was then the only gold refiner in Paris, sold the secret to the Mint; and there is a decree of Francis I., issued at Blois in 1540, raising the value of the coin in consequence—"in order to defray the expense of the assaying water."

From these facts it would appear, that this method of refining was not known in Europe until late in the fifteenth century, although some authors pretend that it was practised in France so early as 1403, in which year letters patent were granted at Paris to one Dominick Honeste, a Genoese, for the separation of gold and silver ("*pour départir les matières d'or et d'argent*"); but there is no proof that he employed any other than the ancient mode. Whether it was known to the Arabians is questionable, as their knowledge of aqua-fortis has not, as we have already seen, been accurately ascertained; although from their early acquaintance with the properties of nitre, it is probable that this liquid was obtained by them at a very remote period.

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* Respecting "*the use of masks in chemical operations,*" see the account of the death of the Chevalier de St. Croix, in the article "*Slow Poison.*"

ARTIFICIAL PEARLS.

NATURAL PEARLS;—ARABIAN METHOD OF PRODUCING PEARLS;—CHINESE METHOD;—PEARL-OYSTER;—LINNÆAN DISCOVERY;—PEARL BEADS;—PEARL ESSENCE;—PROCESS OF MAKING FALSE PEARLS;—PERIOD OF THE DISCOVERY;—ANECDOTE.

NATURAL pearls are calcareous excrescences, which are found as well in the bodies as in the shells of several kinds of crustaceous fish. The supposition that they are only produced in one peculiar species of oyster is a popular error: they have been discovered in the shield of the sea-hare (the *aplysea depilans* of the *systema naturæ*), in some kinds of muscles, and even in the common Colchester oyster. The delicate lustre which they derive from the enamel with which they are encrusted, has ever rendered them favourite ornaments of the fair-sex; and so ancient is their use, that we find them alluded to as articles of value, in the Scriptures.*

It is well known that they were considered by the ancients among their most costly jewelry; but as we learn from the elder Pliny, that they were worn in the time of Nero by the wives of even the inferior public officers, and as it has been ascertained that the Romans were not acquainted with the art of making false pearls, it seems probable that some mode had been early invented to hasten, or perhaps even to occasion, their natural formation. This art, indeed, is known to have been practised in the first centuries of the Christian æra by the natives of the shores of the Red Sea; and we are told by Philostratus, in his life of Apollonius, that it was effected in the following manner:—

"The Arabs first poured oil upon the sea, which it is well known has the effect of calming the agitation of the waves, and consequently of rendering the water more transparent at the bottom.† They then dived in those spots where they knew the fish were to be found, and enticed them to open their shells by rubbing them with some kind of ointment as a bait; which having effected, they pricked them with a sharp instrument, having first placed near them a vessel hollowed out in various places into the form of pearls, into which moulds the liquor which flowed from the wound was received, and there hardened into the shape, colour, and consistence of the native gems."

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* *Scriptures.* Job, ch. xxviii. v. 18.

† See the remarks on this subject in the article "*Diving-Bells.*"

No explanation is given of the necessity for performing this operation under water, instead of catching the animal and carrying it to the surface; nor is it said whether the vessel in which the pearls were thus formed was left in sea-water, or exposed to the air. The art is now lost, and we are not yet sufficiently acquainted with the nature of shell-fish to be enabled to determine the degree of credit due to the account; but a process still employed by the Chinese to cause a peculiar species of the muscle to produce pearls, seems to confirm the account given by Philostratus.*

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* *Philostrat. in vita. Apollon.* lib. iii. c. 57.

At the commencement of summer, when the muscles rise to the surface of the water and open their shells, a few small beads of mother-of-pearl, strung together on a thread, are thrown into them. At the close of the year the muscles are drawn up and opened, when the beads are found covered with an enamel in all respects similar to that of real pearls. Sharp bits of wire dropped into the shells have also been found encrusted in the same manner; and it has been conjectured that the fish had covered them with this substance to protect itself against the points. It is also certain that the pearl-oyster possesses the power of filling up any small openings made in their shells with a calcareous substance which assumes the figure of the orifice; and pearl-fishers are aware that those shells which are rough and irregular usually contain pearls. But it must likewise be admitted, that the most valuable pearls are not found adhering to the shell.

In 1761, the celebrated Linnæus declared that he had discovered the art of forcing muscles to produce pearls, and shewed several which he averred to have been thus obtained.

He, however, disposed of the secret to a merchant at Gothenburgh for the moderate sum of about two hunded guineas, and the heirs of this gentleman again offered it for sale in 1780; from which we may conclude, that however curious it might have been, and interesting to a naturalist, it was not very profitable as a speculation.

It has also been asserted, that pearls are in themselves prolific; and some experiments are even said to have been successfully made on their reproduction and growth. It is, however, quite certain that nothing beyond conjecture has been ascertained on this subject, although the term "seed-pearl" is thought to have arisen from its being the supposed germ of a larger jewel, rather than from its own diminutiveness.

The value always set upon pearls has occasioned various attempts to imitate them. At first it was thought that large pearls might be made from those that were small or broken, and receipts have been published by which it is pretended that object might be effected; but it is impossible to impart to the pulverized substance either the hardness or the lustre of the original. In the beginning of the sixteenth century the Italians invented hollow glass beads, which were incrusted internally with a pearl-coloured varnish; but the sale was prohibited by government as being fraudulent. Solid beads of coloured glass were then invented, and afterwards, small balls of wax and gum covered with enamel, which last are still occasionally used. At length the most approved mode of imitation, now adopted, and which approaches in appearance very near to nature, was accidentally discovered in the following manner.

A bead manufacturer at Paris happening to remark, that when the small fish which we call the bleak (*cyprynus albernus*) was washed, the water was filled with fine silver-coloured scales, it occurred to him to reduce these into powder, and to employ it as an enamel. The experiment succeeded, and produced all the lustre of the finest oriental pearl; but it was found that, when exposed to heat, it separated from the beads and adhered to the skin. To remedy this inconvenience, and at the suggestion of a lady, hollow glass beads were coated inside, in the ancient manner already mentioned, with this powder, which obtained the name of essence of pearl; and thus was brought to perfection an elegant invention, of which the following account will give a tolerably accurate idea.

Of a peculiar kind of fine glass, of a blueish tint, slender tubes are formed, which are then blown into small hollow globules; and the better to imitate nature, the artist gives to some of these, small blemishes, like those occasionally seen in real pearls. In order to incrust these, he mixes the essence with melted isinglass, and blows this varnish into each bead with a fine glass pipe, diffusing it equally over the internal surface by immediately placing the bead thus prepared in a vessel suspended over the table at which he works, and which he keeps in constant motion with his foot. To render the beads solid, they are then filled with white wax, and, being perforated with a needle, they are threaded in strings for sale; but the holes are first lined with thin paper to prevent the thread from adhering to the wax.

Four thousand of these little fish will

scarcely produce a pound of scales, from which not more than four ounces of pearl-essence can be obtained; and as this soon becomes putrid, great inconvenience was often occasioned by the necessity of using it immediately. Attempts were made to preserve it in spirits of wine and in brandy, but these corroded the particles, and destroyed their lustre, and it was long before the important discovery for this art was made, that it can be kept without injury in volatile alkali.

The person to whom the ladies are indebted for this invention, was called Jaquin; and his heirs, not long since, perhaps still, continued the business at a considerable manufactory in the *Rue du petit Lion*, at Paris. The date of the discovery is not, however, precisely known: it has been ascribed by some writers to the reign of Henry IV., and by others to the year 1656; that it was practised with success in 1686 we may presume from an anecdote in the *Mercure Gallant* of that year, in which it is said, that a certain French marquis had insinuated himself into the good graces of a young lady by the present of a necklace of pearls valued at 2,000 livres, but which proved on inspection to be false, and had been purchased for three louis.

Other modes of imitation, or improvements on that of Jaquin, are said to have been discovered within these few years in England; but if so, the inventors have not made them public.

BALLOONS.

ORIGIN OF BALLOONS;—MESSRS. MONTGOLFIER, CHARLES AND ROBERT;—FIRST AERIAL VOYAGE;—DESCRIPTION OF THE BALLOON;—PILATRE DE ROSIER;—LUNARDI; BLANCHARD;—SHELDON;—FIRST ASCENT IN ENGLAND; SADLER;—GARNERIN;—THE PARACHUTE.

THE idea of rising in the air was familiar to the ancients, as well as to the moderns, and various schemes were at different times devised for effecting that object. But these were all upon mechanical principles, which have been proved incapable of answering any useful purpose, and no attempt at aerostation was made until a Portuguese friar, named Guzman, contrived, about a century ago, to launch a paper bag into the air; which, however, fell, after attaining a very moderate elevation. We have no particulars of this experiment, nor did it lead to any farther result, and the subject seems to have been dropped until the late Mr. Cavendish's discovery of the specific gravity of inflammable air again brought it into notice. The possibility of raising a bladder filled with this air through the more dense atmospheric air was then suggested by the ingenious Dr. Black, of Edinburgh, and some experiments were tried by Mr. Cavallo; but the honour of having made the first real balloon belongs to Messieurs Stephen and John Montgolfier, natives of France, and in that country the invention was brought to perfection.

On the 5th of June 1783, all the different states of Vivarais were assembled in the small town of Annonay, when they received an invitation from Montgolfier and his brother, proprietors of a large manufactory of paper in that town, to be present at a physical experiment which was to be made on that day. In the public square there was suspended a sack thirty-five feet in height, made of fine paper lined with linen, the numerous folds of which indicated that its interior was hollow, or only contained atmospheric air in equilibrium with the exterior air. But scarcely was the sack filled by a certain process which the brothers puposely kept secret, than it took the form of a majestic balloon, which swelled gradually, balanced from side to side, and tended to ascend. At length, being freed, it soared above the heads of the spectators, and in less than ten minutes attained the height of more than one thousand fathoms from the earth, when it descended slowly, after having described a space of seven thousand two hundred feet. The experiment was afterwards repeated at Avignon, and a car being attached to the machine, some live animals were sent up in it, and descended without having received any injury.

The ideas of genius are of an astonishing simplicity. By meditating upon the ascension of vapours in the atmosphere, and upon their taking the form of clouds, the secret of raising a machine into the air was discovered to consist in enclosing a fluid, in any light vessel of less weight than the atmospheric air. After some consideration upon the manner of obtaining this fluid, the following method was adopted as being the most simple and the least expensive. A pan of fire placed under the cavity of the balloon, introduced this fluid lighter than the atmospheric air, or rather diminished the weight of the interior air by rarifying it. It was in this manner that the problem was resolved, but the mode of executing it still remained a secret to all but the inventors.

In the mean time, Mr. Charles, a celebrated physician and professor of experimental philosophy, invented a new and more safe method of ascension. Having filled a globe of thin silk—varnished over with the elastic gum commonly called Indian rubber, dissolved in oil,—with hydrogen gas, or inflammable air, it ascended from the Champ de Mars, in the presence of a multitude of spectators, and descended at about four leagues from Paris.

Shortly after this, Montgolfier and his brother, aided by two brothers named Robert, ingenious mechanics, having constructed an aerian bark that was considered both convenient and safe, the celebrated Pilâtre de Rosier, professor of physic, accompanied by the Marquis d'Arlandes, ascended on the 21st

November 1783, before the Court, at the Château de la Muette, in the Bois de Boulogne, and after having traversed the Seine and Paris, descended slowly at the butte aux Cailles. The voyage was not more than four or five thousand fathoms; but it was sufficient to demonstrate the feasibility of the project, and the intrepidity of the act confers eternal honour on the memory of the daring adventurers. The balloon employed on this memorable occasion was of an oval shape, seventy-four feet in height, and forty-eight in diameter, and was superbly ornamented. It contained a gallery suspended underneath for the accommodation of the aeronauts, in which there was a grate, with a supply of fuel, by means of which the machine might be kept in the air at pleasure: the weight of the whole apparatus was upwards of one thousand six hundred pounds.

On the first of December 1783, Messieurs Charles and the brothers Robert ascended from the garden of the Tuilleries, and after having traversed a space of about nine leagues, descended in safety in the plains of Nesles. The machine in which they ascended was considerably smaller than that used on the former occasion; and differed from it in this important particular, that it was filled with inflammable air, which, being much lighter than the heated atmospheric air, possessed many advantages over it. This invention, thorefore, superceded the former, and has been adopted, with some improvements, on all subsequent occasions.

On the 23d of January 1784, Prince Charles, son of the Prince de Ligne, Counts Laurençin, Dampierre, and La Porte, the two Montgolfiers, Pilâtre de Rosier, and a celebrated mechanic named Fontaine, ascended together at Lyons, and descended after a voyage of fifteen minutes.

Sometime afterwards, Pilâtre de Rosier, whom we have already mentioned, accompanied by a physician named Romain, ascended at Boulogne-sur-Mer, intending to land in England. A short time after their ascent they were observed busily employed in opening the valve, and evidently anxious to get down; but before they could accomplish their object the balloon took fire, and descended so rapidly, that both the unfortunate aeronauts were killed. A monumental pillar to their memory marks the scene of the catastrophe.

These were the chief aerial voyages made at that period in France. In England, the first attempt of the kind was made by Vincent Lunardi, an Italian, who ascended on the fifteenth of September 1784, from the artillery ground in London, and descended near Ware, in Hertfordshire. His balloon was formed of oiled silk, and was thirty-five feet in diameter. The gallery was attached by means of a net which was spread over the upper part, and from which cords descended from which it was suspended. The machine had no valve; the inflammable air was introduced through an aperture in the lower extremity, which terminated in the form of a pear, and the gas with which it was filled was produced from zinc by means of vitriolic acid. The first Englishman who ascended in a balloon was Mr. Sheldon, professor of anatomy at the Royal Academy, who accompanied a Frenchman named Blanchard. They rose from Chelsea, and descended, after traversing about fourteen miles, when Mr.

Sheldon was landed; and Blanchard having re-ascended alone, continued his voyage to Rumsey, in Hampshire, being a distance of seventy-five miles from the point of starting.

Mr. Sadler, of Oxford, next ascended from that city, and accomplished a distance of fourteen miles in seventeen minutes. After him, Admiral Sir Edward Vernon, accompanied by Count Zambeccari, went from London to Horsham, in Sussex, in less than an hour.

But the boldest attempt was that of Blanchard and Dr. Jefferies, who actually crossed the straits of Dover on the 7th of January 1785, and landed in safety near Calais. They ascended from the cliff at Dover, on a clear frosty morning, with a favorable, but scarcely perceptible wind. After the balloon was launched, it was found insufficient to support the weight with which it was freighted, and it became necessary to throw out nearly all the ballast; it then ascended slowly, but when about midway across the channel, it began to descend so rapidly that the travellers were under the necessity of throwing out not only the remaining ballast, but every portable article in the car; and this proving ineffectual, they were even reduced to strip themselves, when at length it again rose, and relieved them from the apprehension of terminating their voyage in the ocean: a danger, we may remark, which was on two subsequent occasions very narrowly escaped by Mr. Crosbie and Major Money; the one attempting to cross the Irish Channel, and the other to traverse the German Ocean.

Blanchard, a few months afterwards, made a third attempt, which is remarkable for being the longest aerial voyage that has yet been accomplished. He ascended at Lisle, and travelled three hundred miles before the balloon descended. About the same time Mr. Baldwin ascended from Chester, and afterwards published a very interesting account of his voyage, which may be found detailed, together with much curious information on the general theory and practice of aerostation, on a work by him entitled aeropedia.

From this period we hear but little of balloons for several years, until another Frenchman, the well-known Garnerin, again excited public attention to the almost forgotten subject of aerostation. This gentleman made his first ascent at Paris in the year 1798, accompanied by a female, who, we believe, afterwards became his wife, and frequently repeated the hazardous experiment alone. He visited England in the summer of 1802; and, ascending at Ranelagh, alighted at Colchester, a distance of sixty miles, in three quarters of an hour. This voyage is not alone remarkable as having accomplished the greatest distance in the shortest time, but as having established the fact that the real velocity of the wind is much greater than had been commonly imagined.

Intrepid and adventurous as that spirit must have been which first undertook to explore the regions of the atmosphere in a balloon, it remained for M. Garnerin to exceed all his predecessors by the daring boldness of his descent in a *parachute*. This extraordinary experiment was made in London, and the following is the mode in which it was performed:—

The balloon was of oiled silk, of the usual form, and covered with a net, from which ropes proceeded, which were joined together, a few feet below the under part, in such manner as to form collectively but one rope, from which the parachute was suspended. This machine was in the form of a large canvas umbrella, of thirty feet in diameter, but without ribs, and with a hollow tin tube in lieu of a handle. Several ropes, of about thirty feet in length, were stretched from the edge of the parachute, and terminated in a knot, to which was hung a deep circular basket, in which M. Garnerin placed himself. The single rope which has been described as proceeding from the net that covered the balloon, passed through the tube which formed the handle of the parachute, and was fastened to the basket; so that by cutting this rope the parachute would be separated from the balloon, and in falling down, would be expanded by the resistance of the air. The use of the tube was to prevent the suspending rope from becoming entangled, and to keep the basket at a certain distance from the canvas. The balloon ascended majestically from St. George's Parade, in North Audley Street, and in about eight minutes' time reached to such an immense height, that although the morning was beautifully clear, the spectators could only just discern the basket; when, at that moment when every eye was contemplating the object, M. Garnerin cut the rope, and the parachute suddenly dropped with a velocity that threatened to precipitate him instantly to the earth. A moment afterwards, however, the canvas expanded; the descent became gentle and gradual, and the aeronaut landed in safety in a field near Pancras. He was confused, and somewhat disordered in the stomach, which was attributed to the extraordinary motion of the parachute, which vibrated in its descent like the pendulum of a clock; and to some strong shocks which the basket received on touching the earth; but he soon recovered his spirits, and his health was unaffected.

BLACK-LEAD.

PLUMBAGO;—LEADEN STYLES;—BLACK-LEAD PENCILS;—MINES OF LEIZERSDORFF AND BORROWDALE;—WAD;—SPANISH AND FRENCH PITS;—CRAYONS;—INDIAN RUBBER.

It would be of some importance, were it possible, to ascertain exactly the period when black-lead was first used, as the antiquity of manuscripts ruled with this substance, or of drawings made with it, might then be determined.

Pencils are here alluded to, formed of that metal called *plumbago* or *molybdæna*, although a distinction has been drawn between these names by modern mineralogists. It has been supposed that the use of this metal is as old as certain manuscripts in which lines, often exhibiting a bright lead colour, may be clearly distinguished; but this opinion may be easily refuted by observing, that lines drawn with lead itself have so much the appearance of those made with plumbago, that it is sometimes scarcely possible to perceive the difference; and it has been proved that the ancients used a small round plate of lead for ruling lines, which was less liable to cut the parchment than a leaden style. Professor Schönemann has given a description of two manuscripts of the eleventh or twelfth century, preserved in the library of Wolfenbuttel, in one of which the lines are partly drawn with a style, and partly in a light manner with lead; but the lines in the other, he remarks, have evidently been drawn with a black-lead pencil.* Le Moine also makes mention of a document of the year 1387, which, he says, is also ruled with black-lead, and remarks, that the custom of ruling ceased about the years 1421 and 1424.†

But the antiquity of black-lead pencils could be more easily determined were it known what mineralogist first mentioned plumbago and its uses. It is not clear that this mineral was known to the Greeks and Romans, who, however, certainly meant a real lead ore, or some production of lead works, by the term *galæna.* In Horace's time it is more than probable that red chalk or charcoal was generally used in drawing, as he says:—

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* Schönemann, Versuch eines systems der Diplomatik. Hamb. 1802.

† Le Moine, Diplomatique pratique. Metz, 1765.

> "*Velcum Pausiacâ torpes, insane, tabellâ,*
> *Quî peccas minus atque ego, cum Fulvi, Rutubæque,*
> *Aut Placideiani contento poplite miror*
> *Prælia, rubricâ picta aut carbone,*" *&c.*
>
> Lib. ii. Sat. vii. v. 93-95.

> "If some fam'd piece the painter's art displays,
> Transfix'd you stand, with admiration gaze;
> But is your worship's folly less than mine,
> When I with wonder view some rude design
> In crayons or in charcoal, to invite
> The crowd to see the gladiators fight."
>
> *Francis.*

In a work on fossils written by Conrade Gesner, and printed at Zurich in 1565, mention is made of pencils for writing which had wooden handles, with a piece of lead, or artificial mixture called *stimmi Anglicanum,* and an engraved representation is given of the instrument, which shews that they must have been then very scarce. Thirty years afterwards Cæsalpinus gave a better description of it, and described it as a lead-coloured shining stone, which communicated an ash-grey tint to the fingers, and which, when pointed, was used by painters and draftsmen. He adds, that it was called Flanders' stone, because brought from the Netherlands to Italy.

Imperati, three years after, described it as a smooth mineral, which appears greasy to the touch, and has a leaden color, which it communicates with a sort of metallic brightness. When capable of being crumbled, it was mixed with a certain clay called *rubrica*, and made into crucibles, which were extremely durable in the fire; when dense and firm, it was manufactured into writing-pencils. Bartholomew Ambrosinus calls it *lapis plumbarius*, but his description of it is borrowed from the two last-mentioned authors. Although the use of black-lead for crucibles was known to Imperati, no mention whatever is made of it by several old mineralogists.

The oldest pits with which we are acquainted are those of Leizersdorff, in Germany, and of

Cumberland, but their antiquity is unknown; it may, however, be conjectured to be very remote from the circumstance that the mineral is there provincially termed *wad* or *wadt*, which in the ancient Saxon signifies black. The mines, which furnish the best plumbago, are situated on the Borrowdale mountains, about ten miles from Keswick, and, according to a regulation among the proprietors, they are opened but once in seven years, when, in order to keep up the price of the mineral, only a certain quantity is extracted.

Pettus remarked, in a work entitled the Laws of Nature and Art, published in 1683, that pencils made from it were enclosed in fir or cedar; and Robinson says, in his History of Westmorland and Cumberland, that the country people near Keswick at first used it for marking their sheep, until the art was discovered of employing it for earthen ware, and for preserving iron from rust. The greater part of the plumbago used in commerce comes from Spain, but it is only fit for coarse ink. It is found in the neighbourhood of Ronda, a town in Granada; but the time when the pits were first opened is unknown. The mineral has also been discovered in France, near Curban, in Upper Provence.

The use of plumbago was probably first introduced into Italy in the sixteenth century, and employed in drawing. The pencil first used in that country was composed of two parts of lead and one of tin, fused together, and was called a *style*. The use of red and black chalk is of earlier origin; but no mention of our plumbago is made in the works of the old Italian artists, where it would be as likely to find it, as in treatises on mineralogy.

It is worthy of remark, that the method of effacing the marks of black lead with Indian-rubber was first discovered in England.

BOLOGNIAN STONE.

DESCRIPTION AND PROPERTIES; — MODE OF PREPARATION;—EFFECT;—DISCOVERY;—FIRE-STONE.

The fossil commonly known as the Bolognian stone is chiefly found on the hills in the neighbourhood of Bologna, and sometimes in the vicinity of Rimini. It appears luminous in the dark; and this property has occasioned much learned research, which, however, has been attended with little other effect than that of showing that our theory of light is imperfect, aud that many of the hypotheses upon which it is founded are, at least doubtful, if not altogether false.

This species of stone is usually discovered in a marly soil, in single pieces, of a somewhat conical form and uneven surface, and about two or three inches in diameter; its structure is foliaceous, the colour a semi-transparent white, and it is both hard and extremely heavy. With the exception of its weight and hardness, it bears a near resemblance to that class of gypseous spars called selenites, and has, on that account, been termed, by some mineralogists, *selenites globosus;* but this appellation does not appear to have been adopted in any modern system.

In order to produce the luminous appearance, those pieces are selected which are the purest, the heaviest, and the most laminated: they are then made red-hot, pounded, and reduced to a powder, which is afterwards converted into a paste by means of a solution of gum-tragacanth; and of this small cakes are formed of about an inch in diameter and two lines in thickness. These, being first dried in a stove, are again laid on the fire until they become ignited, after which they are suffered to cool, and are carefully guarded from the air and damp. When one of these cakes is produced, for a few minutes only, to the light, and then suddenly withdrawn into a dark place, it appears to shine like a burning coal; and as it does not exhibit any unusual appearance unless it has been thus exposed, it therefore seems that it must attract the light which it afterwards emits. In process of time this power becomes weakened, and is eventually entirely lost, but may be restored by again subjecting the cake to the operation of fire.

The discovery of this phenomenon took place early in the seventeenth century; and the Italian authors who first noticed it have concurred in ascribing it to one Vincent Cascariolo, a shoemaker of Bologna. This man, who it seems, like many others of that day, dabbled in the science of alchymy, accidentally hit upon it in some of his experiments, and produced it among the initiated, as a mysterious agent in the transmutation of metals, under the imposing name of the sunstone. Notwithstanding the fallacy of any expectation of advantage from it in this way was soon ascertained, the Italian chemists long affected to keep the mode of its preparation a profound secret; and in the "Philosophical Transactions" for the year 1666, it was mentioned, that the last possessor of the art had died without communicating it. Whatever truth there may have been in this assertion, it certainly was again known towards the close of the same century; and a German chemist of the name of Marggraf not only explained the most accurate process of preparing it, but also discovered that similar luminous stones may be composed of the weighty spars and sparry fluors. It has, indeed, been demonstrated that a mixture of calcined oyster-shells combined with flour of sulphur, will produce the same effect, only that the light emitted, instead of being of a fiery red, is white.

It is worthy of remark that, in De Thou's history of his own times,—a work which, although occasionally bordering on the marvellous, is yet too well confirmed to be altogether discredited—it is mentioned, that, in the year 1550, when Henry II. of France, made his solemn entry into Boulogne, upon its restoration by the English, a fire-stone, said to have been brought from India, was presented to him by a stranger, in a foreign habit. De Thou, indeed, says that it not only seemed to burn with inconceivable splendor, but that it actually could not be touched without danger; and, what is still more astonishing, that it would not bear confinement, nor could the art of man secure it within a narrow space, but if closely covered, it suddenly sprung with force into the air.

CHEMICAL NAMES OF METALS.

PRIMITIVE NAMES; — ASTROLOGY; — INFLUENCE OF THE PLANETS; — ASTROLOGICAL NOMENCLATURE; — ANECDOTE OF POPE INNOCENT III.; — SYMBOLICAL CHARACTERS.

As those metals which were first known received the same names as some of the heavenly bodies, it may be asked whether the planets were named after the metals, or the metals after the planets? But it is beyond doubt that the present names were first given to the planets, and afterwards to metals; and also that the Romans borrowed them from the Greeks, and transmitted them at a later period to us. The worship of the sun, as a god, by several rude and barbarous nations, gave rise to the idea that each planet was either a divinity, or the residence of a god, and their folly, in course of time, led them to ascribe the same attributes to the celestial bodies as were generally allowed, in the fictions of their mythologists, to the gods after whom they were named.

The most ancient trace of this division of metals is to be found in the religious worship of the Persians, who held every thing as sacred which amounted to the number seven, on account of the deified planets being of that number. This, in the course of time, laid the foundation of astrology; and hence the planet Mars was supposed to influence war, while Venus excited the softer emotions of love. Thus they named the seven first discovered metals after the seven planets, each of which, according to their opinion, led in its revolution to a gate of the same materials, and represented lead by Saturn on account of its slow motion; tin by Venus, which resembled its lustre and brightness; copper by Jupiter; iron by Mercury, on account of its strength and fitness for trade; a mixed metal by Mars; silver by the moon; and gold by the sun. Such is the opinion advanced by Origen, in his refutation of Celsus (who asserted that the seven heavens of the Christians, and the ladder which Jacob saw in his dream, had been borrowed from the mysteries of Mithras. But it is probable that the transcribers of the former have transposed the names of the gods, for, according to the present system, tin belongs to Jupiter, copper to Venus, iron to Mars, and the mixed metal to Mercury. In this manner the powers and properties of some divinity were ascribed to the metal which bore its name, and thence arose many of the absurd conceits which abound in the writings of the ancient alchymists.

This astrological nomenclature appears to have been known to the Indian brachmans, for, we are informed that a brachman sent seven rings to Apollonius, distinguished by the names of the seven planets, one of which he was to wear every day according to the day of the week; therefore, it is most probable that he was to wear the gold ring on Sunday, the silver one on Monday, the iron one on Tuesday, and so on. The Egyptians dedicated copper or brass to Venus; tin to Mercury; and *electrum* to Jupiter: which last was a mixture of gold and silver, and was perhaps, on this account, considered as a distinct metal, because, at that time, men were unacquainted with the art of separating minerals. Mystical properties have indeed been attributed to precious stones as well as metals, and our readers will no doubt recollect the well-known anecdote of Pope Innocent III., who sent to our King John a present of four rings set with different coloured jewels; begging him, at the same time, to consider seriously their form, number, matter, and colour. The form, being round, shadowed out eternity, for which it was his duty to prepare: the number denoted the four cardinal virtues, which it was his duty to practise: the matter, being gold, the most precious of metals, designated wisdom, the most precious of accomplishments, which it was his duty to acquire: and as to the colour, the green of the emerald represented faith; the blue of the sapphire, hope; the redness of the ruby, charity; and the splendid yellow of the topaz, good works.

The characters by which these metals or planets are expressed, although bearing no affinity whatever to them, shew, nevertheless, how easily the mind may be brought to conceive a connexion between them.

The circle was ever considered, among the Egyptians, to be a symbol of the sun; the semicircle, in like manner, was supposed to represent the moon; the character ♄ designated the scythe of Saturn; ♃ the thunderbolts of Jupiter; ♂ the lance and shield of Mars; ♀ the looking-glass of Venus, an ☿ the caduceus of Mercury.

Among all the characters adopted by chemists, that assigned to gold alone agrees with the above mythological representation. Gold was considered by them to be the most perfect of all metals; silver, which ranked next in their estimation, was designated by a semicircle marked double.

All other metals were distinguished by characters composed of those which represent gold and silver, according as they partook more or less of the nature of these two metals. Gold, with a silver color, is discovered in the character ☿. The cross at the bottom expresses some substance without which quicksilver would be gold or silver; and which is also combined with copper, the possible transformation of which into gold is expressed by the character ♀. The character ♂ bears also an affinity to gold, although the half-cross is written in a more concealed manner; for the upright line should merely touch the horizontal without intersecting it. Tin is composed of one half silver, and one half of the unknown metal, and is thus expressed, ♃. The same unknown metal is predominant in lead, and a similitude to silver is remarked in it, for which reason the character ♄ is assigned to it.

The chemical signification of these characters may be traced to a much earlier period than the Heathen mythology. Some pretend they may be found in the table of Isis, and bring them forward as a proof of the great antiquity of chemistry. In the oldest manuscripts, Mars is represented by the letter Θ with a ς placed above it, and stands for the word Θουρος. The letter Z formerly designated Ζευς or Jupiter, but afterwards a ς was placed at bottom to render it more distinct. The supposed looking-glass of Venus is nothing more than the initial letter, somewhat distorted, of the word Φωσφορος, by which name she was known. The scythe of Saturn has been formed from the two first letters of his name, Κρονος. The initial letter of the Greek word Στιλϐων, the name for Mercury, was formerly written C; and, to mark the abbreviation still more, it has been written υ, which, with the addition of the next letter τ, will nearly form the character ☿.

The present characters, according to Scaliger, must be of very ancient standing, as he says they are found upon many old gems and rings; but their antiquity has not been exactly ascertained.

COBALT.

DESCRIPTION;—ZAFFER;—SMALT;—USES;—DISCOVERY;—EGYPTIAN STAINED GLASS;—CHINESE PORCELAIN;—LAPIS LAZULI;—ORIGIN OF THE TERM COBALT;—INVENTION OF PAINT PREPARED FROM COBALT.

The name of Cobalt is at present given to those minerals which contain that semi-metal, the calx of which may be melted into blue-glass, and which turns common glass of a blue colour. This calx is the only part which is used. The cobalt being first washed and freed from the common mineral bodies, especially bismuth and arsenic, which it contains, is afterwards well calcined, and sometimes mixed with fine sand; it is sold under the name of zaffer (*zaffera*). Sometimes it is mixed with silicious earth and potashes, and melted to a kind of blue glass, which, when ground very fine, is technically called smalts, but is commonly known by the name of powder-blue. These articles are chiefly employed in tinging crystal, enamelling, for imitating opake and transparent precious stones, and painting and varnishing real porcelain and earthen and potters' ware: the cheaper kind is employed in washing linen.

The modern method of preparing cobalt and smalt was undoubtedly invented about the end of the fifteenth or the beginning of the sixteenth century, but whether the ancients were acquainted with cobalt, and used it for colouring glass, is not certain. They opened and worked mines in different places, and made blue glass and enamel, probably from cobalt; but when this mineral failed, this art was perhaps lost for a time, as was that of preparing Corinthian brass. As no species of metal is more various and changeable in its appearance than cobalt, it is difficult to say whether the ancients were really acquainted with it, especially as their term *cadmia* has been applied to several things by different authors, and the use of cobalt does not necessarily imply a knowledge of the metal; thus the moderns made brass for centuries before they were acquainted with the preparation of zinc: besides, bismuth and arsenic, which are great component parts of cobalt, would certainly have been sooner known than they were, had the ancients prepared smalt and cobalt for colouring. It has also been ascertained by chemical experiments on blue tiles found in a Roman tesselated pavement, that the enamel showed not the least trace of cobalt; and as it is possible to impart a blue tint to glass and porcelain by means of iron, it is not improbable that the ancients may have made use of it for obtaining this colour.

On the other hand, as mention has been made, at a very early period, of glass stained blue by the Egyptians, and of the Chinese porcelain which was likewise of a blue colour, we must admit that these people either used ultra-marine or cobalt. A blue is likewise seen on mummies, which, for many centuries, preserves all its beauty. Mention has also been made of a mine of *azur*, in China, probably the *lapis lazuli*, which used formerly to be used for colouring porcelain; but smalt is now sent in large quantities from Europe to China for that purpose.

Cobalt appears to have been dug up in considerable quantities about the end of the fifteenth century from the mines on the borders of Saxony and Bohemia. As it was not at first known to what use it could be applied, the miners threw it away as valueless. It appears, indeed, that the term cobalt took its rise from the supposed worthlessness of the mineral, and was derived from *Cobalus*, which was the name of a spirit that was said to haunt the mines and destroy the labours of the miners.

The invention of paint prepared from cobalt, is, according to the best accounts, ascribed to the middle of the sixteenth century, and was discovered by accident by Christopher Schurer, a glass-maker at Platten. Being once at Schneeberg, he collected some beautiful coloured pieces of cobalt, and, having found that they were capable of fusion, mixed some of it with his preparation for making glass, and thus obtained fine blue glass, which, being afterwards ground, was used as a pigment by potters and painters on glass. At first it was prepared merely for the potters, but, in course of time, became an article of commerce, first with Nuremberg, and afterwards with Holland. Schurer was persuaded by the Dutch to remove to Magdeburg: but he returned to his former residence after some time, and constructed first a hand-mill, and afterwards one driven by water for grinding his glass. Eight colour-mills were constructed in Holland soon after, and the Dutch in a short time excelled in the art of preparing and grinding glass for paint; insomuch that John George, the Elector of Saxony, sent for two colour-makers from Holland, and gave one thousand florins towards enabling them to improve the art. Several other mills were erected in a short time in different parts of Germany, but, from various authorities, it is generally believed that the Dutch constructed the first mills, and were in possession of the secret of making stained glass with cobalt, as early as the beginning of the sixteenth century. Large quantities of this article are imported into England from Germany, for the use of the manufactures, under the different names of zaffer and smalt, according to the mode of preparation, and it is only of late years that efforts have been made to prepare it in this country. An ingenious manufacturer in Yorkshire, who first made the attempt, was ruined by the Excise, which seized upon his stock under the pretext that it was glass, and as such subject to duty; and although it was satisfactorily proved that it was intended to be calcined, and it was admitted by the officers of the crown that the seizure was illegal, yet no redress could be obtained, and the unfortunate man died of a broken heart without being able to perfect the operation.

COLOURED-GLASS.

ANTIQUITY OF COLOURED GLASS;—ANECDOTE OF THE EMPEROR GALLIENUS;—ANCIENT STAINED GLASS;—ARTIFICIAL RUBIES;—OLD CHEMISTS: CASSIUS; LIBAVIUS; KÜNKEL;—PAINTING ON GLASS;—ENAMEL;—MOSAIC WORK.

In all probability the art of making glass and that of colouring it, were discovered nearly about the same time; for, if the substance of which glass is formed contain any metallic particles, it will always assume some tint or other, so that the idea of giving it the tinge of some precious stone, was not difficult to be conceived. Proofs are not wanting to shew that this art was carried on to a great extent among the ancients, as Pliny makes mention, among others, of artificial hyacinths, sapphires, and of that black glass which so nearly resembled the peculiar stone discovered in Ethiopia by Obsidius, and thence termed Obsidian. As a proof that it was, at a very early period, used for the purposes of deception, we are told by Trebellius Pollio that the Emperor Galienus, in order to punish a cheat who had sold his wife a piece of coloured glass for a jewel, ordered him to be carried away to the lions' den, and, when there, desired that a hen should be let loose upon him; after which joke, a crier proclaimed this to be the punishment of his roguery. It would appear also that Alexandria was not alone famous for its glass-houses, and for the skill and ingenuity of its workmen, but also for the art of imparting vivid colours to the substance; for it is related of the Emperor Adrian, that he placed such value on some coloured glass cups, which he had received from an Egyptian priest, as to order them to be only used on festivals.

In some collections of antiquities at Rome, pieces of coloured glass are to be seen which were once used as jewels. In the Museum Victorium, a chrysolite and an emerald are shewn, both of which are quite transparent.

and coloured throughout, and neither have the smallest blemish, either externally or internally; which is not to be accomplished without great care and skill, and which proves that the art had attained to considerable perfection at a very early period.

The materials used by the ancients for colouring glass, have not been described by any writer; but it is certain that metallic calces can alone be employed for that purpose, because these pigments withstand the heat of the furnaces. Ferruginous earth was, most probably, the principal substance used in giving to glass, not only all shades of red, violet, and yellow, but likewise of blue; at present, sometimes an artificial and sometimes a natural iron ochre is employed, in common works, for the same purpose.

In the last century, some German artists discovered the method of making artificial rubies with gold, instead of iron; and these when well set, defied detection, unless tried by a diamond or file. This substance, which must be mixed with the best frit, is called the precipitate, or gold calx of Cassius, also gold purple, or mineral purple.

This Cassius, from whom it takes its name, was called Andrew, as was also his son, which has caused them sometimes to be confounded together; the father was secretary to the Duke of Schleswig, and is not known by his writings; the son took the degree of Doctor, at Leyden, in 1632, practised physic at Hamburgh, and was physician to the Bishop of Lubec; he was also the inventor or preparer of the gold purple, and of a bezoar essence, and the author of a treatise on the properties of gold, illustrated by some curious experiments.

Old chemists probably meant some preparation of this kind, when they talked in the mystic language used by them at that day, of red lions, the purple soul of gold, and the golden mantle; but the allusions of these metaphors are now unknown.

When Libavius published his alchymy in 1606, this manner of making ruby-glass must have been a secret, as he quotes an old receipt for making them, and merely conjectures that they may be made of gold as they are found near gold mines, and probably imbibe the color of that metal; which opinion has not been acceded to by later chemists, particularly by Achard, who found more iron than gold in that precious stone. The conjecture of Libavius, though deduced from false principles, has nevertheless been confirmed by experience.

In the 17th century, the preparation and use of gold purple was brought to great perfection by John Künkel, who afterwards, being ennobled by Charles XI. of Sweden, took the name of Löwenstiern. He made great numbers of artificial rubies, and sold them at a high price by weight. He himself says, he made a cup of ruby glass weighing twenty-four pounds, and full an inch in thickness, of a beautiful color throughout, for the Elector of Cologne. He was afterwards, in the year 1679, appointed inspector of the glass-houses at Potsdam, by Frederic William, Elector of Brandenburgh, who at the same time gave 1,600 ducats to perfect them. A cup with a cover of this manufacture is still preserved at Berlin.

We may almost reckon painting on glass, and in enamel, and the preparation of coloured materials for mosaic work, as branches of the art of colouring glass; and in all these, a fine red is the most difficult to obtain. The old master-pieces of painting on glass are always found to have a transparent red varnish burnt into them on one side, or, when stained through and through, the panes are thinner than those coloured in the other manner. In all likelihood, therefore, the old artists used iron or manganese, which pigment soon becomes, when greatly heated, blackish and muddy. A red colour in mosaic work is obtained with less difficulty, as opacity, rather than transparency, is required. Those pieces which shine like the finest sealing-wax, are most valued at Rome, where they were at one time, made, from a kind of copper dross, and only by a man named Mathioti; at present several artists in that city prepare these materials, but are unable to give them a perfect high colour.

DYEING.

ANTIQUITY OF THE ART;—INGENUITY OF THE ANCIENT DYERS; — TAPESTRY; — BABYLONIAN PURPLE; — DYED CLOTH OF MEXICO AND OTAHEITE;—THEORY OF DYEING.

DYEING is the art of fixing certain colouring materials permanently and with uniformity into the fibres of wool, linen, cotton, silk, and other fibrous or filamentous substances. Few arts can lay claim to greater antiquity, and still fewer attained, in ancient times, so great a degree of perfection. It certainly preceded painting, and appears to have been known in the earliest ages of the Jews, Babylonians, and Egyptians, who selected and applied colours for stuffs, cotton, linen, and silk, with the greatest judgment and dexterity. These were extracted from the animal, vegetable and mineral kingdom; and, without confining themselves to cloth or silk, they dyed equally well leather, ivory, tortoise-shell, the hair of animals, wood, earth, wax, and even imparted a permanent colour to marble.

However, no sooner had the art of painting been carried to some degree of perfection, and the mere outline been filled up by the crayon, and enriched by the natural colours of the object intended to be delineated, than the art of dyeing was united to that of painting, and the needle was full as much employed upon colours as the pencil. According to Pliny, coloured embroidery and tapestry, were known to be of high antiquity among the Jews and Babylonians, but both these arts pre-suppose the existence of outlines, for the artist must have drawn from a pattern. It is possible that the story of Pandion, king of Athens, and of his daughter Philomela, who informed Progne of her misfortunes by describing them on tapestry, may be fabulous; but, be this as it may, the fable, we know, is of remote origin, and, according to Apollodorus, was probably the invention of one of the Cyclic poets. This admirable mythologist says, that Philomela did not paint her history, but embroidered it, in characters, on a veil. Still, at the period when this fable was invented, embroidery can scarcely be conceived to have been confined to the exhibition of characters alone, and was unquestionably used more freely in the art of tracing and designing. In the time of Homer, we have undoubted proof of the application of tapestry to the delineation of historical subjects. In the third book of the Iliad, Iris finds Helen occupied in representing in embroidery the evils sustained on her account by the Greeks and the Trojans; and Andromache, when informed of the death of Hector, was employed in depicting flowers of various colours on tapestry:—

> "Αλλ᾽ ηγ᾽ ιστον υφαινε μυχω δομου ὑψηλοιο
> Διπλακα, μαρμαρεην, ενδε θρονα ποικιλλ᾽ επασσε.."

> "Far in the close recesses of the dome,
> Pensive she plied the melancholy loom;
> A growing work employed her secret views,
> Spotted diverse with intermingled hues."
>
> *Pope.*

Lucretius likewise says:—

> "*Quam Babylonica, magnifico splendore, rigantur.*"
>
> Lib. iv. l. 1023.

> "Wetting the rich and Babylonian dye."

The antiquity of the art of dyeing may be still farther authenticated by the perfection to which this art has been carried immemorially in Hindoostan, China, and Ceylon; and likewise by the coloured and figured cloths found, not only in Mexico, but even in the island of Otaheite, on their discovery. Perhaps the circumstance of their being found in Otaheite is the one most in point: for there, unquestionably, the web and woof were dyed previous to their being woven; whereas, in the former place, the cloths, skins, and barks, were generally painted on, rather than imbued with the colouring materials. Yet the art was carried to astonishing perfection by the Mexicans, either by dyeing or painting, at the period when their country was discovered by the Europeans. We are informed that, on the arrival of the Spanish squadron, exact representations of the ships, painted on cloth, were immediately sent to Montezuma; and this was the method they employed for keeping their records, histories, and calendars. From the specimens of Mexican hieroglyphics preserved in the Bodleian library, their materials for colouring appear to have been chiefly obtained from the mineral kingdom, and to have consisted of earths rather than animal or vegetable substances.

The objects usually dyed are either of animal or vegetable origin. Among the former may be classed wool, silk, hair, leather, and skin of every description; to the latter belong cotton, flax, and hemp. There is an essential difference between the affinity for colouring matter possessed by these substances, so that the process for dyeing wool, for instance, may have no effect upon cotton; nor is there any accordance in the quantity of colouring ingredient necessary to dye each stuff. This has been proved by a simple experiment, in which a piece of cloth was woven, of which the warp was wool, and the woof cotton; this was fulled, in order that each substance might undergo the same preparation, aud then dipped in a scarlet vat. The wool alone took the colour; the cotton, when rinsed, remained white. Silk has been found to take twice as much cochineal to dye it as wool. The different force of affinity between different fibres and colouring-matter is likewise shewn by the more or less perfect manner in which they exhaust a coloured bath; thus wool dyed in a weak solution of sulphate of Indigo, entirely absorbs the dye, and leaves the solution colourless, whereas silk only partially takes the colouring matter from the sulphuric acid. Wool is, generally speaking, more susceptible of taking and retaining the colour than any other substance; silk and other animal matters follow; next to them cotton, and lastly hemp and flax; but this opinion is to be taken in the greatest latitude, nor do those substances which take colour the easiest always retain it the longest.

EAU-DE-LUCE.

COMPOSITION;—PROPERTIES;—LUCE;—DU BALEN.

The pungent essence known by the name of Eau-de-Luce, is, in fact, when properly made, a fluid volatile soap of an agreeable odour, which, instead of the fixed alkali and tallow, of which common soap is made, is composed of caustic volatile alkali and highly purified oil of amber. It is of a milky colour, which it retains if good, but loses it when adulterated, as often is the case, with spirit of sal ammoniac. In its quality of soap it is employed to extract stains from cloth, which cannot be removed by common soap. As a medicine, it is administered, mixed with water, for many diseases and accidents, among others as an antidote to the bite of some snakes; and it acts as a powerful stimulant when applied to the nostrils in cases of fainting.

The process of compounding this volatile essence requires operations that were long secret, and the chemists, in their researches for the true method, have given various receipts for preparing it: some assert that it can be made perfectly bright without injury to its colour; and among these was an apothecary at Lisle, called Luce, from whom it is said to derive its name; but the blue tint which he imparted to it, and which at one time brought it into great notice, was derived from copper.

The first mention that is made of Eau-de-Luce in medical treatises occurs in the *Recueil périodique d'Observations de Médecine*,* in which it is said to have been made in the year 1742. The inventor is not certainly known; but the French writers ascribe the discovery to a Parisian apothecary named Du Balen.

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* "*Recueil, &c.*" Vol. v. p. 224, ed. 1756.

FULMINATING POWDER.

DETONATING BALLS;—AURUM FULMINANS;—PROPERTIES;—INVENTION;—BASIL VALENTIN;—ANCIENT COMPOSITION OF DETONATING GOLD;—MODERN RECEIPTS FOR DETONATING GOLD AND SILVER;—FULMINATING MERCURY.

THE preparation which a few years since obtained so much celebrity in London under the name of detonating balls, is known to chymists by the various appellations of *pulvis pyrius aureus*, *aurum volatile*, and more commonly *aurum fulminans;* and these names have given rise to a very general supposition, that it is chiefly, if not entirely, composed of gold: it is, however, produced from either gold or silver, and forms a powder which, when heated, or merely crushed, explodes with a tremendous report. The strength and violence of this substance are truly terrific, and have occasioned many serious accidents to incautious persons; but it, notwithstanding, can never be employed as a substitute for gunpowder, even were the value of the metals from which it is extracted not a consideration, because the explosion does not take place while it is confined. It has, as yet, been considered merely as an object of curiosity, but it is still not improbable that it contains virtues with which we are unacquainted; it is said that it may be employed to advantage in enamel painting, and it has lately been applied to an ingenious improvement in the locks of fire-arms.*

The origin of this invention is lost in the obscurity of the writings of the ancient alchymists, whose wild speculations and unproductive experiments are, for the most part, detailed in an unintelligible jargon, which often served to give an air of mysterious importance to discoveries of little value. It seems probable, however, that it was invented by Basil Valentin, a German Benedictine monk, who lived early in the fifteenth century. There is, indeed, reason to suppose that Valentin made many important observations respecting the properties of gold; but such is the care he has taken to veil them, that they are almost as unintelligible as the Egyptian hieroglyphics, until some supposed new discovery has been made, which is afterwards found among his works, in a passage which no one could previously understand. His writings are, therefore, of about the same utility as were the answers of the ancient oracles, the meaning of which could not be comprehended while they could be of use, and which seldom served any other purpose than to mislead those who attempted to interpret them, before the occurrence of the event to which they referred rendered all explanation unnecessary. But the account which he has given of this detonating gold is so unusually clear, that it would almost seem that he was not aware of the precision with which he had written. As the work in which it is to be found—entitled his last testament—is scarce, a literal translation of the receipt may not be uninteresting.

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* See the art. "*Fire Arms,*" B. iii. for an account of this improvement.

"Take a pound of good *aqua-regis* made with sal ammoniac, I mean a pound of good strong aqua-fortis, and dissolve therein eight loths of sal ammoniac, by which means you will obtain a strong aqua-regis, and distil and rectify it until no more *fæces* remain at the bottom, and that it be quite clear and transparent. Then take fine gold-leaf which had been prepared with antimony, pour the aqua-regis over it, and let so much gold be dissolved as it will take effect upon. When the gold is all dissolved, pour into it a little *oleum tartari*, or *sal tartari* dissolved in water, and it will begin to effervesce strongly; when it has effervesced, pour some of the oil again into it, and repeat this until all the dissolved gold fall to the bottom, and the aqua-regis is quite pure and clear. When that is effected, pour the aqua-regis from the gold calx, and wash it carefully in pure water eight, ten, or even twelve times. Then, when the gold calx has well settled, pour the water off, and dry the gold calx in the open air, but not in the sunshine, nor yet over the fire, for so soon as this powder is exposed to a very small degree of heat, it explodes with great violence, and does much mischief, as its force is such that no one can withstand it."

From an addition to this receipt, which it would be superfluous to transcribe, it appears that Valentin had also discovered, that this powder could be again deprived of its force by boiling it during four-and-twenty hours in strong distilled vinegar; and, in some other parts of his writings, he says that the same effect may be produced by sulphur.

The modern receipts for the composition of fulminating powders, are as follows:—

Gold.—Dissolve pure gold in nitro-muriatic acid to saturation, and dilute the solution with three times its quantity of distilled water, adding gradually some pure ammonia. A yellow precipitate will thus be obtained which must be repeatedly washed with distilled water, and dried on a chalk-stone or in a filter.

Silver.—Dissolve fine silver in pale nitric acid, and precipitate the solution by lime-water; decant the fluid, mix the precipitate with liquid ammonia, and stir it till it assumes a black colour; then draw off the remaining fluid, and leave it in the open air to dry.

The effects of the latter product are much more violent than of that obtained from gold. It explodes by the mere touch: its preparation is so hazardous, that it should never be attempted without a mask with strong glass before the eyes; and no more than a single grain should at any time be tried as an experiment. There is, however, another preparation of detonating silver, less dangerous than the one just mentioned, and which does not explode without a slight friction, in contact with combustible bodies.

Besides these, a fulminating powder is produced by a preparation of mercury mixed with sulphur ; and it is known that mercury, and most, if not all its oxyds, may, by treatment with nitric acid and alcohol, be converted into a whitish crystallized powder, possessing all the inflammable properties of gunpowder, together with many peculiar to itself.

GREEK FIRE.

PERIOD OF INVENTION ; — COMPOSITION ; — USE ; — FIRE-SHIPS ;—FIRE-ENGINES.

It is a commonly received opinion, that the inflammable substance which bore the name of " Greek fire " was employed by the ancient Greeks, and that the mode of preparing it was lost at a remote period of modern history. It was not, however, invented until about the year 678 of the Christian æra, when it was discovered by Callinicus, an architect of Heliopolis—which city was afterwards called Balbec—and its use was not discontinued in the East until towards the close of the thirteenth century. Various conjectures have been formed respecting its composition, and some prescriptions have been preserved in ancient historians ; among which the oldest, and perhaps the most to be relied on, is that mentioned by the Princess Anna Comnena, in which the component parts are said to be resin, sulphur, and oil. It has not, however, been found possible to produce a substance from these ingredients similar in its effects to those recorded of the Greek fire, and all that has been ascertained on the subject merely tends to prove that it was a liquid.

The chief purpose for which this extraordinary fire was employed, was to annoy the enemy in naval engagements; for which purpose itwas thrown from large engines, or sometimes, as it appears, blown through tubes. Fire-ships were also prepared with it, and introduced among a hostile fleet, and occasionally jars were filled with it, and cast on board the hostile vessel by means of projectile machines. Joinville alludes to the latter, in his history of St. Louis, wherein he mentions, "*ung engin qu'ils appellaient la Parriere, par lequel ils nous gettoient le feu Gregois à planté.*" They were made of metal, painted and gilt, with the extremity resembling the open jaws of some animal, and were usually placed on the prow of the ship, to which they formed an ornament. These machines are called, by ancient writers, spouting engines, and it seems that they projected the fire to a considerable distance. It is mentioned by John Cameniata, when speaking of the siege of his native city, Thessalonica, which was taken by the Saracens in 904, that the enemy threw fire into the wooden works of the besieged, by means of tubes and other vessels; and the Emperor Leo, who about the same time wrote his treatise on the art of war, recommends such engines to be constructed on the forecastle of ships. Εχετω δε παντως τον σιφωνα κατα την πρωραν εμπροσθεν χαλαῳ εμφιεσμενον, ως εθος, δι ὀὺ το τοκευασμενον πυρ καεα των εναντιων ακοντισει. *Tactica*, cap. xix.

GUNPOWDER.

OLDEST ACCOUNT OF GUNPOWDER;—FRIAR BACON;—MANUSCRIPT OF MARCUS GRÆCUS;—ALBERTUS MAGNUS;—ANTIQUITY OF THE INVENTION.

It has been commonly supposed, that the oldest information of which we are in possession respecting gunpowder is to be found in the works of Friar Bacon,* who died in the year 1294, and he is, accordingly, generally considered as the inventor. He, however, only alludes to it so far as to say, that from saltpetre and *other ingredients*, a fire may be made that shall burn at any distance; and it has been conjectured, from an anagram under which the secret is supposed to be enveloped, that these "other ingredients" were charcoal and sulphur.

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* "*Bacon.*" De secretis operibus artis et naturæ, et de nullitate magiæ, cap. 6.

There is, however, a manuscript preserved in the Royal Library, at Paris, written by one Marcus Græcus,* who is, by some, supposed to have lived in the ninth, and by others in the thirteenth century, which professes to give an account of a combustible for the annoyance of the enemy, and in which there is a passage from which that in Bacon's works is evidently taken. The same recipe has also been copied by the celebrated Dominican monk, Albertus Magnus,† who died in 1280, and whose reputation for learning was as great, in Germany, as that of Roger Bacon in England. The manuscript of Marcus Græcus is supposed to allude only to the Greek-fire, but it is worthy of remark, that he repeatedly mentions saltpetre, which is not even alluded to in any of the ancient receipts for the composition of that combustible.

Although we may admit that Bacon was in possession of the secret of the composition of gunpowder, it yet seems probable that the invention took place even prior to the earliest period assigned to the manuscript of Marcus Græcus, and that the knowledge of it was obtained in Europe through the Saracens. The Chinese claim acquaintance with it from the remotest æra of their history; the use of it in war is forbidden in the Veidam, the ancient sacred institutes of the Hindoos; and it is supposed to have been employed in the battle fought near Mecca in the year 690. In support of this surmise it may also be observed, that in no country could saltpetre, and the various purposes to which it may be applied, be more easily discovered than in India, where the soil is so rich in nitrous particles, that little more is necessary than to lixiviate it in order to obtain saltpetre; and where, in fact, this substance is produced in such abundance, that from it is made almost all the gunpowder that is used in Europe.

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* "*Marcus Græcus.*" Liber ignium ad comburendos hostes; Auctore Marco Græco: published at Paris, 1804.

† "*Albertus.*" De mirabilibus mundi.

HUNGARY WATER.

COMPOSITION;—ORIGIN OF THE NAME;—INVENTION;—RECEIPT.

Hungary water, so long celebrated for its medicinal qualities, is nothing more than spirit of wine distilled upon rosemary; whatever virtues it possesses, independent of the spirit, must therefore be entirely attributed to the qualities of that plant. In order to extract these effectually, the herbs should be quite fresh, and the spirit be not only strong, but the distillation should be frequently repeated. This process is, however, too expensive to allow of the essence being disposed of at the moderate price for which it is commonly sold; the greater part, therefore, of what is usually found in the perfumers' shops, is merely common uncoloured brandy, flavoured with a few drops of the essential oil of rosemary. The chief place of its manufacture is Montpellier, and other towns in Languedoc, in which province rosemary is produced in great perfection; but it is also made in this country.

The original name "*Eau de la Reine d'Hongrie,*" would seem to imply that it was a Hungarian invention; and accordingly we find that it was first made known by Elizabeth the widow of Robert, King of Hungary, so early as the fourteenth century. This lady, it appears, although then more than seventy years of age, was not only cured of the gout, and restored from a state of debility to perfect health by the use of this water, but became so brisk and handsome, that, as she herself tells us, a king of Poland, whose own age, however, is not mentioned, actually fell in love with her! Upon this Professor Beckmann gravely remarks that, in his opinion, she must have been either inordinately vain, or else in her dotage; but the world affords more examples of such *vieilles amourettes* than those of *Ninon de l'Enclos*.

The original receipt for preparing this invaluable lotion, written in letters of gold in the queen's own hand writing, is said to be preserved in the imperial library at Vienna. A copy, from an equally authentic source, has been inserted among a small collection of medical remedies written by one John Prevôt, and published in Germany in 1659. The account he gives of it is too curious to be omitted, and is as follows:—

"As the admirable efficacy of the undermentioned remedy has been certified to me in many instances, I shall relate by what chance I hit upon it. In the year 1606, I saw among the books of Francis Podecather, a gentleman of a most noble Cypriot family, and with whom I enjoyed the greatest intimacy, an extremely old breviary, which was held by him in the greatest veneration, as having been presented to his ancestors, as a token of mutual friendship, by St. Elizabeth, formerly Queen of Hungary. In the commencement of this book there was shewn to me a remedy for the gout, written by that queen's own hand in the following words, which I then copied:—

"I, Elizabeth, Queen of Hungary, being in the 72d year of my age, and both very in-firm and gouty, used for one year this receipt, which was given to me by a certain ancient hermit whom I never saw neither before nor since, and was quickly cured and restored to strength, and appeared to all in a manner so extraordinary beautiful, that the King of Poland sought me in marriage, we being then both in a state of widowhood. But I refused, for the love of my Lord Jesus Christ, from whose angel I believe that I received this medicine. This is the receipt:—"

"R. Aquæ vitæ four times distilled part 3. The tops and flowers of Rosemary, part 2. To be put together in a close stopped vessel,and allowed to stand in a warm place during fifty hours, then to be distilled in an alembic, and of this once every week one drachm to be taken in the morning, either in the food or drink, and every morning the face and the diseased limb to be washed with it."

The original of this ancient receipt is written in the latin of those times, from which the above is a literal translation. Prevôt, it seems, mistook this Elizabeth for St. Elizabeth, daughter of King Andrew II., who, in fact, never was Queen of Hungary, but who died Landgravine of Thuringia, in 1235. But it has been ascertained, by the will of the queen in question, that she actually did bequeath two breviaries, the one to her daughter-in-law, the other to one Clara Von Puckur, the similarity of whose name with that of Podecather renders it probable that she may have been an ancestress of the family in whose possession it remained.

MAGNETISM.

MAGNETIC CURES;—MESMER;—ANIMAL MAGNETISM;—SOMNAMBULISM;—DE MAIGNAUDUC;—VALENTINE GREATRAKES.

THE external use of the magnet has been brought into vogue in modern times as a new discovery, but it was, in fact, known to Ætius, who lived so early as the fifth century: for that author expressly says, that those who are afflicted with the gout, or with convulsions, find relief from holding a magnet in their hand. Marcellus, who wrote in the fifteenth century, assures us that it is a sovereign remedy for the tooth-ache; Baptista Porta recommended it in the following century for the head-ache; Kircher mentions, about the same time, that it was worn about the neck as a preventive against convulsions and affections of the nerves; and, towards the close of the seventeenth century, magnetic tooth-picks and ear-picks were fashionable specifics for pains in the teeth, eyes, and ears.

But, whatever efficacy may have been possessed by these remedies, must be attributed to the actual application of the magnet, and did not belong to that pretended science denominated *animal magnetism*, which was thus introduced :—

Towards the close of the last century, and shortly before the commencement of the French Revolution, one Mesmer, a German physician of some note, arrived at Paris, and pretended to possess a mysterious doctrine, by means of which he had performed several sudden and astonishing cures.

The properties of the loadstone, and all the electrical discoveries, led Mesmer to affirm the existence of an universal fluid, which governs the stars and the three reigns of nature. This fluid, considered in man, whom he viewed as a perfect electrical machine, he called animal magnetism. Of this he insisted that some individuals have too much, and others too little; but he supposed that the superfluous quantity could be taken from those who have too much, and communicated to those who stand in need of it. By analogy with artificial electricity, he contended that the fingers of man may be considered as excellent points whence this fluid may be extracted, and the entire hand may serve to communicate it where it is wanting. His ordinary apparatus for proving the truth of this theory was a stand of bottles arranged in a certain order, bordered with points of iron, dipped in water at one end, and communicating at the other with the circle of sick people, who were connected to each other by a cord. This simple preparation sufficed to produce the most extraordinary effects on the imagination of persons who were rendered credulous by the hope of a sudden recovery from disease. At the commencement of the operation the patients usually appeared dejected; but as Mesmer, placed in the centre of the circle, affected, with various gestures, to extract and communicate the miraculous fluid, the sympathetic power of the imagination gradually began to take effect; the most robust men and the most delicate women seemed to be agitated by similar sensations, and the most extraordinary, as well as the most ridiculous scenes, were often exhibited. When the crisis of the operation approached, they fell into a kind of prophetic somnambulism, and while in this state they revealed their disorders, and, as if by inspiration, declared the most proper remedy to be applied. The imagination, which possesses the faculty of restoring as well as of injuring our organs, effected some cures, at least of a momentary nature, and many nervous persons, whose only malady existed in idea, were restored to health by the same delusion which had deprived them of it.

Two celebrated men, Duport and D'Eprémesnil, who both figured in the revolution, were the most remarkable proselytes to Mesmerism. Many others of more illustrious rank, of graver habits, and of a more mature age, were attached to his doctrine; but when the French physicians had, by invitation of government, explained the system of animal magnetism, and destroyed an hypothesis which rested on a few cures, probably the effect of the imagination rather than of the operation of electricity, Mesmer disappeared, and the sleep-walking prophets, driven from Paris, carried their convulsions and their reveries into the country, where the good sense of the peasants opposed so ridiculous a doctrine.

To Mesmer succeeded de Maignauduc, who for a long time continued this species of quackery in London, and having filled his coffers at the expense of the public credulity, he retired to enjoy the fruits of his imposition. But several proselytes remain; and even to this day there are many persons, who not only place the most implicit confidence in the principles of animal magnetism, but who also pretend to put them in practice.

Although Mesmer was the first who attempted to rank this pretended discovery among the sciences, to determine its principles and to give it a name, yet he was not, as has been generally supposed, the original inventor of the deception. About the middle of the sixteenth century, an Irish gentleman, named Valentine Greatrakes, acquired great reputation by numerous cures of various disorders, which he effected by simply touching the part affected. Crowds flocked to him from all parts, and he performed such extraordinary cures, that he was cited in the Bishop's Court at Lismore, and not having a license as a physician, he was prohibited from practising in future. He was, notwithstanding, engaged by Viscountess Conway to visit her Ladyship, in England, for the purpose of removing an inveterate head-ache with which she was afflicted. He arrived in the year 1666, and so great was his fame, that, as he proceeded through the country, the magistrates of the different towns through which he passed requested his assistance for the sick; and his Majesty commanded his attendance at Whitehall. During his residence in London, he was attended by crowds of all ranks; and as a proof that these were not merely the simple and the uninformed, we are assured that Flamstead, the celebrated astronomer, even made a journey to Ireland, to be touched by him for a weakness of constitution. At length, however, his reputation, which was only built upon the public credulity, yielded to the force of sense and argument; and, notwithstanding many certificates of most extraordinary cures, attested by several of the most eminent persons of the age, he retired to Ireland, and died in obscurity.

There was this great difference betwixt Mesmer and Greatrakes—the former was undoubtedly an impostor, the latter merely an enthusiast. He had been an officer in the army, and afterwards a magistrate of the county of Cork; but he retired from those situations, and giving himself up to religion, he at length became persuaded that he had the gift of curing various distempers. He ascribed many disorders to evil spirits, which he divided into separate classes, and these he drove by his touch from one part to another, to the utmost extremities of the body, from which they were then entirely eradicated. Although he was so far from convincing every one of the reality of his miraculous gift, that many wrote violently against him, yet he found some zealous advocates even among the faculty, and, on the strictest inquiry, no kind of blemish was ever thrown upon his character.

MANGANESE.

GLASS ;— ROCK CRYSTAL ;— FUSION ;— PROPERTIES OF MANGANESE ;—ANCIENT USE ;—ETRUSCAN VASES ;— DISCOVERY.

GLASS is not, as is generally believed, made in our glass-houses ; the glass-makers merely bring the glass, already produced by nature, into a state of fusion ; and afterwards form it into vessels of divers sorts. But as it is not of itself a fusible substance, it is generally mixed with some alkaline salt and calcareous earth, which necessary addition always renders it more fragile and brittle. This it is which gives the polished rock-crystal so great a superiority over the best crystal glass of our glass-houses. However, glass-makers might use a very little of the addition already mentioned, and even lessen the quantity employed, by exposing their glass a long time to the fire; but, it must be remarked, that it then becomes so tough and difficult of fusion, that the usual method of treating it can no longer be employed. Hence those who prepare artificial precious stones, or prisms of a superior kind, must first anneal the glass in the furnace, and afterwards break it, and give the proper form to the pieces by grinding them. Sand of any kind, and every description of siliceous earth, if not too impure, suffice for common green, or blackish green glass; but the purest sand, or quartz, and the purest alkaline salts, must be used for white glass, which composition is greatly improved by the addition of some manganese to the frit, which is a mixture of sand, or siliceous earth, and alkaline salts.

In general, manganese resembles some kinds of iron-stone, and as iron was known at an early period to colour glass, it was probably by accident that manganese was discovered to render frit colourless, which it will do when added sparingly: if added in large quantities, it imparts a violet colour to the glass, something similar to that of the amethyst. This discovery was made, in all probability, by endeavouring to colour glass with manganese, at first supposed to be a species of iron; and it was no doubt soon found that it gave beautiful shades of violet, red, and dark brown, according to the quantity of it that was used; and also that, if employed in very small quantities, it rendered the glass white.

The period when this useful discovery was made is unknown, but it was undoubtedly made use of in Pliny's time, as he speaks of a magnet used for making glass white, and manganese certainly does resembles the magnet in many respects. The word *Alabandicus*, used by the same author, has by many been thought to mean manganese, but was more probably the name for a calcareous earth, added to promote the fusion of the sand.

It is not improbable that the ancients used manganese for glazing and painting their pottery; and, indeed, it has been positively asserted, that some Etruscan vases and lamps were painted with the same manganese that we use for our earthenware.

The colours on the Etruscan vases do, certainly, bear some resemblance to those on our stone-ware, but, it must be remembered, that they might have been produced by calx of iron. The substances employed by the ancient potters can, indeed, only be determined by positive testimony or by experiments; but the former is not to be found, and the latter have not been made. It may also be observed, that in former times the same objects were often accomplished by means totally different from those now in use, and thus coloured glass was made by the Romans without any acquaintance with our cobalt or mineral purple.

The way in which manganese is supposed to have been first employed was as a magnet for attracting glass, because the ancients conceived that there existed a magnet for every other kind of metal as well as for steel; and as manganese was, in consequence of its similarity, considered as a magnet, it was subjected to experiments which led to the discovery of its real properties.

The manganese imported from Piedmont was in Germany for a long time considered the best, which was, however, afterwards superseded by another kind brought from Perigord, in Guyenne, and called *pierre de Perigueux*, or *lapis petracorius*. This has been considered as a particular species of manganese. Its principal characters are a resemblance to burnt coal or cinder, a shining surface, and, on being fractured, an appearance of fine stripes a little coloured. A peculiar kind of metal called *magnesium*, or *regulus magnesii*, has been found in manganese; it was first mentioned in the year 1770, by a German mineralogist named Ignatius Gottfried Kaim; but a Frenchman of the name of De la Peyrouse likewise discovered it, in a native state, in an iron mine in the county of Foix. The chief mines of manganese are situated in Germany; but it is also found in England, where the first mine was discovered by Boyle.

NITRE AND SALTPETRE.

NEUTRAL SALTS;—SALTPETRE;—LEPROSY OF HOUSES;—SODA;—NITRE;—ANCIENT USE;—ORIGIN OF THE TERM;—REGALIA.

THE question whether our saltpetre was known to the ancients, is one that has occasioned as much discussion among the learned as almost any other relating to the natural history of antiquity, and still remains in a great measure undetermined.

The properties which form the essential difference between saltpetre and other neutral salts are its peculiar cooling acid taste; its fusibility when exposed to moderate heat; and its inflammability: which latter quality, when brought into action, destroys its acidity, and leaves only the vegetable alkali of which it is composed. It is chiefly employed in the fabrication of gunpowder and of aqua-fortis, and it is also largely used as an antiseptic.

The putrid fermentation of animal and vegetable matter produces a nitrous acid, which combines with calcareous earth, and forms what is termed *earthy saltpetre;* which, being decomposed by fixed vegetable alkali, that again connects with the acid, becomes *common saltpetre.* It sometimes also happens that the nitrous acid is found united with mineral alkali, and then produces that species known as *cubical saltpetre.* These substances are produced by the spontaneous efforts of nature, aided by the combinations of chemical art; pure *native saltpetre* being rarely found except in hot countries, where, indeed, it is known to effloresce from the earth in large quantities. This efflorescence is also sometimes perceptible on walls: it is observable by the decay of the masonry, which it appears to corrode, and is the leprosy of houses alluded to in the Mosaic law.* To this incrustation the ancients gave the name of *nitron,* or *nitrum;* but it must have been of very undefined quality, for it is as frequently found to consist of that mineral alkali which modern chymists term soda, as of calcareous saltpetre, and various other salts have been discovered in similar situations, produced by the same cause. The manner of procuring soda from the ashes of certain plants seems also to have been known at a very early epoch to the Egyptians; but it was not distinguished from the other salts, which it resembled, and was only known under the same denomination.

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* "*Mosaic law.*" Leviticus, chap. xiv., v. 34, and following.

Substances so essentially different certainly ought not to have been all included under one common appellation; but when natural history was yet in its infancy, and ere it began to be considered as a science, an error was fallen into, the very reverse of that committed at present, and instead of classing every minute variety under a distinct head, according to the modern practice, objects whose properties were totally dissimilar, were comprehended under the same name: thus, at one period, the Romans designated every pulpy globular fruit as an apple; the elephant and the rhinoceros were classed among the oxen; the sable and the ermine were denominated mice, and the ostrich took its place among the humble tribe of sparrows. It is not, therefore, to be wondered at that the ancients, who were, besides, unacquainted with any accurate method of separating salts, should have ascribed opposite and irreconcilable qualities to the nitre; or that, as they were ignorant of the use of calcareous saltpetre for the purposes of making aquafortis and gunpowder, they should have chiefly distinguished the mineral alkali, which was alone valuable to them in consequence of its uses in domestic economy, and in the various processes of fulling, of painting, and of glass-making.

Among the domestic purposes to which nitre was applied, were those of both preserving animal food from putrefaction, as well as the opposite intent of rendering meat that was too fresh, tender, by immersing it in a ley of nitre, and it was commonly added to bread, in baking, in order to render it light; practices which still prevail in the East. It was generally used both for scouring apparel and cleansing the person; which latter circumstance is distinctly mentioned in the scriptures :—

> " For though thou wash thee with *nitre*, and take thee much
> " soap, yet thine iniquity is marked before me, saith the Lord
> " God."—*Jeremiah*, ch. ii. v. 22.

And we also learn from Ovid, that the Roman ladies formed from it some of their most valued cosmetics, as well as constantly employed it at the bath. It entered into the composition of many medicinal receipts, and was in the remotest ages one of the chief agents in the process of embalming.* Some agriculturists imagined that leguminous plants were improved in flavour if the pulse from which they were produced had been steeped in a solution of nitre, or if the dung with which the ground had been manured was impregnated with it; and vegetables of the cabbage tribe were strewed with it, both in order to promote their growth, and to render them tender. Others merely attributed to it the virtue of protecting the seed-corn from the attacks of insects;

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* For " *the process of embalming*," see article *Museums*, vol. i. b. i.

but a general notion seems to have prevailed that it increased the bulk and quality of the grain :—

> "*Semina vidi equidem multos medicare serentes,*
> "*Et* NITRO *prius, et nigra perfundere amurca,*
> "*Grandior ut fœtus siliquis fallacibus esset.*"
>
> *Virg. Georg.* lib. i.

> "Some steep their seed, and some in cauldrons boil,
> With vigorous nitre and with lees of oil,
> O'er gentle fires the exuberant juice to drain,
> And swell the flattering husks with fruitful grain."
>
> *Dryden.*

The origin of the term *nitre* has not been defined, though it seems probable that it was derived from *Nitria,* a province of Egypt, whence it was anciently exported in large quantities. The name is of great antiquity; it occurs in the Scriptures,* and appears to have been carried from Egypt and Palestine to Greece, and thence to Italy. Some European travellers in the Levant, in the sixteenth century, having heard the name *natrum* applied to the mineral alkali produced there, conceived that it was specifically employed to distinguish that particular species of salt from vegetable alkali, or *nitrum;* although, in fact, they are synonimous terms, the former being merely a corruption of the latter. The error, however, was adopted by Linnæus, and implicitly received by all the modern systematizers, some of whom have discoursed very learnedly upon the *nitrum* and the *natrum* of the ancients, although the latter word is not to be found in any author of antiquity. There are many reasons for supposing that saltpetre was not known in Europe until some time in the thirteenth century, when it was distinguished from the common nitre by the name of *sal nitri,* and afterwards of *sal petræ.*

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* "*Scriptures.*" Proverbs, ch. xxv. v. 20. Jeremiah, ch. xi. v. 22.

When saltpetre became of importance to Government, in consequence of its employment in the manufacture of gunpowder, some of the states of Europe had recourse to a most extraordinary expedient, in order to procure it at a cheap rate. It was assumed as a part of the *regalia,* or rights attached to the prerogative of the crown, that the efflorescence on the masonry of houses, which has been already mentioned, belonged to the monarch; and, under that pretence, persons were empowerd to search the dwelling-houses for saltpetre, and to scrape the walls whenever there was any appearance of it. The first instance of this oppression on record occurs in the year 1419, when Gunther, archbishop of Magdeburgh, farmed out this right on condition of receiving a certain quantity of refined saltpetre in return. His successors continued the practice; and it is probable that it was adopted by most sovereigns. So late as the eighteenth century, it was carried so far in some parts of Germany, that the inhabitants of towns and villages were compelled to erect and maintain walls expressly for the purpose of producing saltpetre, but under the gracious promise that the collectors should no longer be allowed to search for it in private houses. In the duchy of Wurtemberg, and in the Prussian states, where this singular tax was most rigorously enforced, it was not abolished until the year 1798, and then only upon an indemnification being given to Government for the loss.

In many parts of the East-Indies the earth is so richly impregnated with saltpetre, that it may be extracted by lixiviation, without any other process, and, in that warm climate, brought to crystallize without the aid of fire. These advantages, combined with the low price of labour, render it so cheap, that it is now found more advantageous to import it than to manufacture it in Europe; and, indeed, the power of producing it is so limited, that all the oppressive exertions of the ancient regalia could never procure sufficient for the gunpowder used in the various continental wars. The importation was probably commenced by the Dutch, as the article appears among the lading of their ships at the earliest period of their trade with India, and they long enjoyed an exclusive monopoly of it. Whether the Portuguese brought saltpetre to Europe, on the discovery of the passage round the Cape of Good Hope, does not appear.

PRINCE RUPERT'S DROPS.

ORIGIN OF THE NAME;—FORMATION;—PROPERTIES;—BOLOGNA PHIAL.

The toys which, in this country, commonly bear the name of "Prince Rupert's Drops," are known among men of science by the name of *Lachrymæ vitræ*, and on the continent by that of *Larmes Bataviques*, or Batavian Tears. They acquired the latter appellation from their having been first made in Holland; and the first from their having been introduced into England by the celebrated Prince Rupert, in the time of King Charles II. They are formed by merely pouring a drop of fused green glass into water, by which means the rounded substance assumes an oblong form, terminating with a fine and nearly capillary extremity. If the smallest end of this fragment be broken off, the whole mass instantly bursts into the finest dust, whereas the thick end will, on the contrary, withstand a very powerful blow. These singular properties did not attract the notice of experimental philosophers until the middle of the sixteenth century, when some unsuccessful attempts were made, both in Paris and London, to ascertain the principles on which they are founded; but it is probable that they must have been known in glass-houses from time immemorial, and as their formation is so simple, the discovery was no doubt made by accident.

There is another equally curious toy, formed upon a similar principle, termed the *Bologna phial.* It is a small bottle, thicker at the bottom than the top, and cooled immediately without annealing. It will bear the stroke of a mallet, or of any blunt instrument, or the concussion of a leaden bullet dropped into it from a considerable height; but if any sharp body, however small, fall into it from an elevation of only a few inches, the bottom cracks all round and falls off; and when very brittle, any hard angular substance will pass through the bottom, however thick it may be, apparently without resistance. Hollow cups made in this manner, of green glass, some of them three inches thick at the bottom, have been instantly broken by a splinter of flint weighing only two grains, although they had resisted the shock of a musket ball from the height of three feet.

Several theories have been built upon these phenomena, but all nearly equally inconclusive, and the discovery of the cause still baffles the researches of science.

ROCHELLE SALTS.

DISCOVERY;—COMPOSITION;—PROPERTIES;—VEGETABLE AND MINERAL ALKALIES:—GLAUBER'S SALTS.

THE medicine so generally known under the title of Rochelle salts was first prepared and brought into use, in the latter end of the seventeenth century, by a French chemist of the name of Seignette. He first called it alkaline salt, then *sal polychrest*, and lastly, it acquired its present appellation from the place of his residence, which was Rochelle.

The discovery of this remedy was entirely due to accident. It is a compound of mineral alkali, soda, and the acid of winestone: Seignette, while engaged in making soluble tartar, employed the salt of soda instead of winestone, through a mistaken notion that there was but one kind of fixed alkali, and thus unexpectedly saw a new salt produced, quite different from the soluble tartar which he intended to make, and from every other known salt. On closer examination, he found it to be a laxative; and by recommending it with confidence, and having the discretion to keep the mode of procuring it a secret, he secured an extensive sale of it during many years, and thus acquired a considerable fortune.

At length men of science investigated this secret salt, discovered its component parts, and made them generally known. The consequence of this was, a more minute inquiry into the difference between the vegetable and mineral alkalies, which has thrown much new light on chemistry, and has led to many important improvements in the arts.

In like manner the celebrated medicinal salt invented by Glauber, and known by his name, was an accidental discovery made by that chemist, while in pursuit of the philosopher's stone.

SEALING-WAX.

SEALING-EARTH;—BEES'-WAX;—BLUE-WAX;—ANCIENT MODE OF SEALING LETTERS;—INVENTION OF SEALING-WAX;—ANTIQUE SEALS;—WAFERS.

THOSE writers who treat of ancient diplomas, mention five materials, besides metals, wherewith letters and deeds were sealed; namely, cement, paste, bees'-wax, sealing-wax, and sealing-earth. The latter was in use among the Egyptians at the earliest epoch of their history: when their priests selected cattle for sacrifice, they bound upon their horns a piece of paper, on which they placed some adhesive earth, impressed with their seal, to mark the destined victims. This was probably the first substance employed for sealing. Frequent mention of it occurs at a later date in both the Greek and Latin authors; but the particular kind of earth of which it consisted has not been ascertained, and none that we are acquainted with would answer a similar purpose; it therefore seems probable that it was not used in its natural state, but was, perhaps, some coarse species of cement.

Bees'-wax, in its natural state, is supposed to have been used in Europe time immemorial for the purpose of sealing: but it is not easy to determine whether yellow or bleached wax was employed for that purpose; for age occasions the former to lose much of its colour, while the latter acquires, with time, a yellow tinge, so that the oldest seals that have been preserved, appear to have been of white, and the more modern of yellow wax, although it is probable that the contrary was the fact. In process of time this wax was coloured red, and, at a still later period, green and black. It has been remarked, as a matter of some surprise, that seals of blue wax have never been discovered: but this ought not to excite astonishment, as the art of communicating a blue colour to wax has not yet been invented, nor does it seem probable that it ever will, for the blue vegetable dyes all lose their natural tint, and acquire a greenish hue, on being combined with wax.

It is evident, however, that wax, in its natural state, could only serve to receive the device of the signet, and could not effectually close a letter; for the latter purpose, therefore, a silken thread was usually wound round the cover, and, for the greater security, was drawn through a piece of wax on which the seal was impressed.

The invention of sealing-wax, which served the double purpose of security and ornament, is not supposed to have been known in Europe before the beginning of the sixteenth century. The oldest authenticated seal of this kind, that is known to be in existence, is on a letter, dated London, the 3d of August 1554, to the Rheingrave Phillip Francis Von Dhaun, from his agent in England, Gerhart Hermann: it is of a shining dark-red wax, and bears the initials of G. H. Mention is indeed made, in the "Original Letters written during the reign of Henry VI., by John Fen," of a letter, in the year 1455, the seal of which, he says, "is of red wax;" but by this, no doubt, nothing more than common wax is to be understood. We are also ignorant of the country to which this invention belongs. It may be attributed with much appearance of probability to Spain, from its having been originally termed *Spanish-wax;* but this circumstance loses much of the importance that would otherwise attach to it, from the well-known fact, that it was customary in those days to call every thing that was new or curious "Spanish." It has been ascribed to a Frenchman of the name of Rousseau, at so late a period as the year 1640; but this is evidently a mistake. That person, it appears, had long travelled in various parts of the East-Indies; and having, on his return to Paris, where he resided as a merchant, lost all his property by an accidental fire, it occurred to him, in his endeavours to support a large family, to make sealing-wax from gum-lac, "*as he had seen it prepared in India.*" This was patronized by Louis XIII. and his court, and Rousseau gained by it, in the first year of his enterprize, full 50,000 livres. From this, however, it would appear that the sealing-wax now in most general use was an improvement actually introduced by him; for it certainly is chiefly composed of gum-lac, whereas that formerly employed, and still occasionally, although the quality is indifferent, was a composition of either melted resin, or purified turpentine and cinnabar.

With regard to the antiquity of wafers, but little has been collected. Paste of flour was, indeed, very anciently used for closing letters; but that substance is not supposed to have been employed for seals more than about two centuries, and the oldest that has yet been discovered on the Continent is a red wafer seal affixed to a letter, dated from Spire, in the year 1624.

SLOW-POISON.

ANCIENT POISONS;—OBEAH MAGIC;—HIERONYMA SPARA; TOFANIA;—AQUA TOFANA;—MANNA OF ST. NICHOLAS; —HISTORY OF THE MARCHIONESS DE BRINVILLIERS AND THE CHEVALIER DE STE. CROIX;—THE CHAMBRE ARDENTE;—SUCCESSION POWDER;—POWST;—COMPOSITION OF THE AQUA TOFANA;—CATASTROPHE OF THE MARQUIS DE BRINVILLIERS;—EFFECTS OF POISONS.

By slow-poison we generally understand all those preparations which can be administered imperceptibly, and which gradually weaken the vital powers, and finally cut short the life of man. That the ancients were acquainted with poisons of this kind, can be proved by the testimony of many of their authors; some of whom mention preparations that could be moderated in such a manner as to produce death at any period, from two or three months to as many years.

But these were composed from vegetable and animal substances, among which the most remarkable are supposed to have been aconite and the sea-hare, or *Lernæa* (the *aplysea depilans* of the Linnæan system), and the more active and powerful mineral extracts seem to have been unknown to them.

It cannot be objected that such discoveries were beyond the chemical knowledge of the period to which they are ascribed; for the unlettered natives of Africa, and the Indians of America, are in possession of poisons of this kind, and apply them with such skill, that those to whom they are administered, if not destroyed within a given time, die at least in a lingering manner, and without being sensible of the treachery of which they are the victims. It is this secret which forms the foundation of that mysterious influence, still possessed by some old negroes in the West-Indies over their fellow slaves, so well known under the name of the *Obeah magic*; the dread of which is so great, that the unfortunate beings who are only threatened with its operation, pine away in mere terror of the consequences, and its real effects are so certain, that no precaution can avail to save from destruction those who are its intended objects. As an instance of which, it is not many years since an African negro was executed in the island of Martinique, for practices of this kind, who, in his last moments, confessed that he had secretly administed poison to more than twenty of his master's slaves, all of whom perished without the least suspicion of the cause.

But poisons of this nature have never been prepared with greater art, nor any where more extensively used, than in Italy and France during the seventeenth century. It was remarked at Rome, about the year 1659, that many young married ladies suddenly became widows, and many husbands who were known to have become disagreeable to their wives unexpectedly died. Suspicion fell on a society of females under the direction of an old woman, who pretended to foretell future events, and who had in fact correctly predicted the death of many persons, to those who were interested in the event. A spy was employed, who introduced herself to this sorceress as a person of distinction, suffering under the tyranny of an imperious husband, of whom she wished to be rid; and by means of this stratagem her secret was detected. The whole society were then arrested, and put to the torture; and the hag herself, whose name was Hieronyma Spara, along with several others, publicly executed. It appeared that many of the Roman nobility were implicated in this affair; and, notwithstanding the severity with which it was visited, traces of the same suspicious practices were remarked for a long time afterwards. Spara was a Sicilian, and was said to have acquired her knowledge from the celebrated Tofania; but the difference of their age renders it more probable that she was the instructress of the latter.

Tofania, if not the inventress of the far-famed drops which from her obtained the name of *aqua tofana,* at least carried the diabolical art of preparing them to the greatest perfection. She first resided at Palermo, but afterwards at Naples, where she was more particularly known, and whence the drops have also been commonly called *acquetti di Napoli.* There was, at Bari, in the kingdom of Naples, a miraculous oil, said to distil from the tomb of St. Nicholas; and the credulity of the people inducing them to employ it as a remedy for certain disorders, it was sold in small glass phials bearing the image of the saint, and an inscription purporting that they contained "*manna of St. Nicholas of Bari.*" The apparent sanctity of these securing them from suspicion, Tofania employed them for the distribution of her drops: but it seems that, like her friend Spara, she reserved them for the service of those of her own sex to whom the yoke of matrimony had become irksome; and, if the history of those times be not incorrect, the toilet of few married ladies of distinction at Naples, and other parts of Italy, was without a phial of the precious manna. This poison was limpid and tasteless as pure water, so that it was impossible to guard against its attacks: a few drops, administered at different periods, were sufficient to destroy a man by slow and imperceptible degrees; and it was supposed, that through its effects not fewer than six hundred persons perished.

Tofania lived to a great age; but suspicion having at length fallen on her, she took refuge in a monastery, from which she was dragged by the officers of justice, notwithstanding an outcry raised by the clergy at the violation of ecclesiastical privilege. Being put to the rack, she confessed her crimes, and acknowledged that, the day before she absconded, she had forwarded two boxes of *manna* to Rome, where it was actually found in the custom-house; but it never appeared who had ordered it. She was afterwards, it is said, privately strangled: but in the accounts of her fate there is considerable discrepancy; for Labat says that she was arrested in 1709; Keysler, another traveller, affirms, on the contrary, that she was still living at Naples in 1730, and resided in a convent, in which she was protected as in a sacred sanctuary, and where many strangers used to visit her from motives of curiosity; and Garelli, who was physician to Charles VI. king of the two Sicilies, and whose authority on this point is most to be relied on, writes to a friend, about 1719, that she was still in prison at Naples.

This infamous art, however, no where ever excited greater interest than at Paris. About the year 1670, Margaret d'Aubray, wife of the Marquis de Brinvilliers, a nobleman of large fortune, commenced an intrigue with a young officer of a distinguished but needy family, named Godin de Ste. Croix. After a short period she lost her husband, whose property she had partly dissipated; and still openly continuing her intimacy with De Ste. Croix, her father procured a *lettre de cachet*, had him arrested, and thrown into the Bastille. He there got acquainted with an Italian, who instructed him in the manner of preparing poisons. After a year's imprisonment he was released, and immediately flew to the Marchioness, to whom he communicated the baneful art, which she undertook to practise for the improvement of their circumstances. She then assumed the garb of a nun of the order of *Les Sœurs de la Charité*, distributed food to the poor, administered to the sick in the *Hôtel-Dieu*, and thus tried the effect of her poisons, undetected, on these helpless wretches. She bribed a servant to poison her own father, and her brother, and endeavoured to poison her sister: the two former perished; but a suspicion having arisen of the cause of their death, the sister was on her guard, and thus escaped. She then, however, avoided detection, and the guilty pair continued their villainous practices, in security, until they were at length providentially brought to light in the following manner:—

De Ste. Croix, while preparing poison, always wore a glass mask; but this once happening to drop off by accident, he was, as it is said, suffocated by the vapour, and was found dead on the floor of his laboratory. As he was without apparent heirs, Government caused an inventory to be taken of his effects, among which there was found a sealed casket, with a label to the following effect:—"I hereby intreat, that those into whose hands this box may fall, will have the kindness to deliver it into the hands of the Marchioness de Brinvilliers, who resides in the *Rue neuve St. Paul*, as its contents concern her alone, are her sole property, and can be of no use to any other person; and in case that she should die before me, I beg that it may be burned, with all that it contains, without opening it. That no one may plead ignorance, I swear by that God whom I adore, and by all that is sacred, that I advance nothing but the truth; and if these, my just and reasonable wishes, be not complied with, I charge the conscience of those who infringe them with the consequences, both in this world and the next, in order that I may relieve my own: protesting at the same time that this is my last will. Done at Paris, this 25th of May, in the afternoon, 1672.—DE SAINTE CROIX." The singularity of this request formed the strongest inducement not to comply with it: accordingly the casket was opened, and in it were found various pacquets, with inscriptions signifying that they contained poisons, the effects of which had been proved by experiments on animals.

The Marchioness, having failed in an attempt to obtain possession of the casket, fled to England, and thence to Liege, where she took sanctuary in a convent. In order to entice her from this privileged abode, consecrated by folly for the protection of vice, a police officer, in the disguise of an Abbé, obtained an introduction to her, and assuming the character of a lover, persuaded her to leave the convent on a party of pleasure, and then arrested her. At first she denied all that was laid to her charge; and while in prison, she behaved with great levity, passing the greater part of her time in playing at picquet. But she had been guilty of the extraordinary imprudence of making out a catalogue of her crimes, which, in her own hand-writing, was found among her effects in the convent. Upon this she was convicted; and having afterwards acknowledged the horrid detail, which contained a series of the most shocking atrocities, she was publicly beheaded, and afterwards burned at Paris, on the 16th of July 1676, and met her fate with a degree of resolution amounting almost to unconcern. It may afford matter for curious speculation to the disciples of Lavater to learn, that nature had not been sparing to the Marchioness of the beauties of her sex: her features were regular, the contour of her face extremely graceful, and her whole air wore that appearance of serenity, which is considered as an indication of virtue.

But the punishment of this French Medea did not put an end to the practice of secret poisoning; which, on the contrary, was carried so far, that, in 1679, a special court, called the *Chambre ardente*, was instituted to try offenders of this class. Among the persons brought before this tribunal were two women—La Vigoureux, and La Voisin. The latter was a midwife: but both were also pretended fortune-tellers, and privately sold philters and slow-poison; which last, from the use that was supposed to have been made of it by impatient heirs, obtained the quaint title of *succession-powder*. Curiosity had induced many persons of the first rank to visit these women in their apparent character of fortune-tellers, without any intention of employing them for a worse purpose; and of all those who had thus been the dupes of their imposture a list was found in the possession of La Voisin. Among these was the distinguished name of the Maréchal de Luxembourg, who was in consequence arrested, and detained for some months in the Bastille.

Several persons of condition were for a long time imprisoned, although afterwards acquitted; some of inferior rank suffered by the hands of the common hangman; and, on the 22d of February 1680, La Vigoureux and La Voison, after having had their hands first bored through with a hot iron, and then cut off, were burned alive.

Various conjectures have been formed respecting the composition of these poisons. For a long time the sale of aqua-fortis was prohibited at Rome, from an idea that it formed the chief ingredient; and at Paris it was once imagined, that the succession-powder consisted of diamond-dust, and afterwards, that it was composed of sugar of lead: but all these surmises have been proved to be equally unfounded. The casket of De Ste. Croix contained regulus of antimony, sublimate, vitriol, and opium, in an uncompounded state, together with a large quantity of prepared poison, the component parts of which the chemists were not able to discover. The *aqua tofana* is said to have been an extract of opium and cantharides; and this supposition has gained the greater credit from its being generally understood that the poison known in the East-Indies by the name of *powst* is obtained from the juice of the poppy. But on this point, the evidence of Garelli, whom we have already mentioned, seems to be conclusive; and he says, that he was informed by his Majesty Charles VI., to whom all the judicial procedure, together with the confession of Tofania herself, had been transmitted, that it was nothing more than a decoction of crystallized arsenic, with the addition (probably for the mere purpose of disguising it) of the herb cymballaria.

Whatever may have been the ingredients of these poisons, their effects appear to have been uniformly the same, and are thus described in the account of the symptoms that attended the death of the father of the Marchioness de Brinvilliers:—"After having languished during a considerable period, he was seized with a loathing of food, and his stomach rejecting every kind of aliment, he was reduced to extremity, and at length expired without any fever, but with a strong sense of heat in the stomach. During the last three days he perceptibly wasted, and towards his dissolution he had become much shrunk. On opening the body, the stomach and the duodenum were discovered to be black, and sloughing off: the liver was mortified, and wore the appearance of being burned." The son of Monsieur d'Aubray lingered in a similar manner during three months, and his intestines were found in the same state: and on the decease of Charles XI. of Sweden, who is known to have died of the effects of slow-poison, which occasioned a consumptive disease, his stomach and liver were observed to be ulcerated.

It, however, is not probable that poison can act in a precisely similar manner upon every constitution; nor can it, for the same reason, be true, that it can be so prepared as to occasion death within a given period. The circumstances attending its administration can seldom be ascertained, and when death is attended with any mysterious appearance, it is too much the custom to attribute it to this cause. Thus, in France, the extraordinary deaths in the family of Louis XIV., and, at a more recent period, that of Madame de Pompadour, and those of the Dauphin and Dauphiness, the parents of his present Majesty, have all been ascribed to slow poison; and although that opinion has been combated with great force and ingenuity, by that very able writer Monsieur Lacretelle, in his late "History of France during the eighteenth Century," it nevertheless continues to be that of a great majority of the nation.

STEEL.

PROPERTIES;—FORMATION;—ANCIENT NAMES;—ANCIENT AND MODERN PROCESSES OF MAKING STEEL;—HARDENING WATER;—WOOTZ.

Steel is the same metal as iron, but possesses some remarkable properties which distinguish it from common iron. It has a much greater degree of hardness than common iron, which it is capable of filing; strikes fire with vitreous stones, and scratches the hardest glass; is heavier, and emits a stronger sound than iron; exhibits a finer grain when fractured; is capable of bearing a very bright polish, and is susceptible of greater elasticity. It likewise becomes more slowly magnetic, but retains that power longer; is not so subject to rust, and gives fewer sparks than iron, when ignited. It assumes various tints in the fire, and when heated, is soon cooled by being immersed in cold water, which renders it harder, more brittle, and by far less pliable than iron. It is not known whether iron is changed into steel by being condensed, or by the loss or addition of carbon, caloric, manganese, molybdæna, or some other component part. However, it is certain that the invention of steel is of very great antiquity, as, although we do not find any distinct mention of it in the Old Testament, still it is clear that it was known to the Greeks in the time of Homer, and received from them several names, the most common of which was *stomoma*—though this word is thought to imply the operation of steeling, or the steeled part of an instrument, rather than steel itself. *Chalybs* was a name given to steel from the Chalybes, a people inhabiting the southern shore of the Pontus Euxinus, between Colchis and Paphlagonia, which country was renowned for its mines, and particularly for its iron and steel works; some derive the name of this people from the chief article of their commerce, which derivation is the more probable, as a river of Spain, where there were steel works, was, according to Justin, called *Chalybs*, but at a much later period.

Adamas was another word which first signified steel, and many epithets derived from *adamas* are applied to articles made of steel and iron. This name was not given to the diamond until a late period.

The Romans borrowed the word *Chalybs* from the Greeks, and it is thought by many that they likewise gave the name of *acies* to steel; but *acies*, in reality, means only the cutting part or edge of any instrument, and not the steel itself. From this word the Italians have, notwithstanding, derived their *acciajo*, and the French their *acier*.

Two methods of making steel are at present employed: the first of which is by fusion, either from iron-stone or raw iron; the second by cementation, the antiquity of which process is unknown; but the former, as practised by the Chalybes, has been twice described by Aristotle. However, the steel of the ancients, by not being cemented, was capable of being hammered, and was not near so brittle as the hardest we are acquainted with.

The method used in Spain by the Celtiberians for preparing steel, was, first to bury the iron in the earth, and to leave it in that situation until the greater part of it became covered with rust; what remained, without being oxigenated, was made into weapons, particularly swords, with which bones, shields and helmets might be cut asunder. However improbable this may appear, it is yet certain that the same method is still practised in Japan; and Thunberg informs us, in his travels through that island, that the sabres made there are so incomparably tempered, that a nail can with ease be cut through by them without injuring the edge. It has, indeed, been supposed that the softer parts of iron are first converted into rust, and that what remains is properly the substance which we call steel. In support of which theory it has been remarked, that on digging up the floor of an old house in Göttingen, an anvil was found which had lain for many years buried in the earth: it still retained its original form, but was become so soft that it could be easily crumbled to pieces; and, when broken, the fracture every where displayed small white grains of a metallic brightness, closely resembling polished steel.

The art of hardening steel by immersing it in cold water of a sudden, when red hot, is of great antiquity. Homer alludes to it in his Odyssey, when relating how Ulysses put out the eye of the giant Polyphemus with a burning stake :—

> "Ως δ᾽οτ᾽ ανηρ χαλκευς πελεκυν μεγαν, ηε σκεπαρνον,
> Εν υδατι ψυχρω βαπτει μεγαλα ιαχοντα,
> Φαρμασσων (το γαρ αυτε σιδηρου τε κρατος εστιν)."
>
> *Lib. ix. l.* 391.

Sophocles likewise has used the comparison of being hardened like immersed iron; and Salmasius has quoted the work of an old Greek chemist, who treats on the method of hardening iron in India. Several rivers and wells were in great repute among the Romans for hardening iron, and, for that reason, had steel works erected near them, although at a great distance from the mines. Some articles of iron, which were not required to be very hard, were immersed in oil.

It is said that the Archduke Cosmo, in 1555, prepared a liquid from certain herbs, which rendered tools, immersed in it, when red-hot, so hard as to be able to cut a large block of porphyry, and to form it into a basin for a well; but the herbs of which this composition was made are unknown. That any herbs should possess such power is indeed very questionable, for we learn from the latest researches, that all kinds of known hardening fluids hitherto invented are in nothing superior to common water. Some writers have affirmed, that a water might be made capable of rendering porphyry soft, but this is probably an error.

The invention of converting bar iron into steel, by immersing it into other fused iron, and leaving it in that state several hours, is generally ascribed to Reaumer: but this process had been mentioned by authors who lived prior to his time, as one well known and practised in their days.

Among the dearest kinds of steel mentioned by ancient writers were the *ferrum Indicum* and *Sericum*. A hundred talents of the former, which appears to be the *ferrum candidum,* were sent as a present to Alexander in India. The method of preparing it is yet a secret, although it is probable that it is still prepared in that country, and known under the name of *wootz:* it is supposed to be a kind of fused steel.

SYMPATHETIC INK.

ANTIQUITY OF THE INVENTION;—MILK;—METALLIC SOLUTIONS;—MAGNETIC WATER;—COMMON SYMPATHETIC INK;—ORIGIN OF THE NAME.

If we apply the name of sympathetic ink to every fluid which, when written with, the letters do not leave any visible impression on the paper, but yet become legible after a certain operation for that purpose, such liquids were certainly known at a very remote period. They are mentioned by many ancient authors; and among the methods by which Ovid counsels young ladies to elude the vigilance of guardians, in an epistolary correspondence with their lovers, he particularizes that of writing with new milk, and of rendering the letters conspicuous by means of soot or charcoal-dust:—

"*Tuta quoque est, fallit que oculos, e lacte recenti*
Litera: carbonis pulvere tange; leges."
De Arte Amand, lib. iii.

New Milk, or pointed spires of flax, when green,
Will ink supply, and letters mark unseen.
Fair will the paper shew, nor can be read,
'Till all the writing's with warm ashes spread.—*Congreve.*

In modern times the ingenuity of the sex is not taxed for expedients of this kind: the art of chemistry has been enlisted into the service of Cupid, and sympathetic ink is every where to be found, which conceals the contents of a billet-doux from the eyes of all but the favoured possessor of the secret.

For this purpose certain metallic solutions are employed, which being in themselves nearly colourless, are nevertheless susceptible of being made visible, either by being washed over with some other solution, or fumigated with its vapour.

Among these, none has excited more astonishment than a composition which becomes instantly black on being exposed, even at a considerable distance, to the vapour of arsenical liver of sulphur. Such, indeed, is the penetrating quality of the vapour, that the change in colour will be effected, even should the writing be placed on the opposite side of a thin partition; and it is, therefore, often employed with success by jugglers. It is a French invention; but the discovery has been attributed to accident, and probably is not very ancient, as the first mention of it occurs in the works of Borel, printed in 1653, in which it is ascribed to an apothecary of Montpelier, named Brosson. It is there called *magnetic water*; and its composition and effects are thus described:—"let quicklime be quenched in pure water, and while cooling, add to it some orpiment which had been heated upon warm ashes, strain the liquor, and preserve it in a bottle closely stopped; then boil pounded litharge of gold in vinegar, and in a brass vessel, during half an hour; filter it through paper, and preserve it in a similar manner. If you write with this last solution, the writing will be invisible when dry, but on being washed with the first, will immediately become black; and, what is truly surprising, although sheets of paper, or even a board, be placed between the writing and the liquid, the effect will still be the same, and the intervening substance will have been penetrated without any apparent trace." From this account it would appear that the inventor himself was ignorant of the effect to be produced by fumigation.

Another curious kind of sympathetic ink, and that in most general use, is prepared from cobalt. Writing executed with this becomes invisible in the cold, but re-appears, of a beautiful green colour, on being exposed to the fire; and the same phenomenon occurs so often as the experiment is repeated. This invention was, for a long time, ascribed to a Frenchman of the name of Hellot, who was, indeed, the first to make it publicly known; but it was really discovered in the beginning of the last century, by a German lady, whose name has not been ascertained.

After the visionary notion of the occult sciences was exploded, it became customary to attribute to magnetic effluvia, phenomena of which the principles were unknown, and more especially those which appeared to act without any visible or sensible agency; and hence the origin of the title "*magnetic water*" formerly applied to this fluid. Others concealed their ignorance under the equally specious cloak of a vague principle which they termed *sympathy*, as, in later times those of attraction and electricity have also been often employed; and from thence was derived the term which it still bears, in defiance of sense and science.

TIN.

ANTIQUITY OF TIN;—STANNUM;—ELECTRUM;—CASSITEROS;—TIN TRADE OF THE PHŒNICIANS;—CASSITERIDES ISLANDS;—ICTIS;—DISCOVERY OF TIN IN GERMANY;—ART OF TINNING.

It is commonly supposed that the metal which we call tin, was known as early as the time of Moses, as it is imagined that mention is made of it, under the name of *bedil*, in several parts of the Holy Scriptures.* That the Greeks and Romans, although not possessing mines of this metal, were acquainted with it, is most certain, as vessels of tin have been sometimes, though very rarely, discovered among the Greek and Roman antiquities.

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* "*Holy Scriptures.*" Numbers, ch. xxxi. v. 22. Ezekiel, ch. xxii. v. 18, 20; ch. xxvii. v. 12. Zacharias, ch. iv. v. 10.

It has been generally supposed that the metal termed *stannum* by the ancients was the same as our tin; but this substance was, according to Pliny, obtained from a metal called *plumbum nigrum*, commonly mixed with silver, and, without doubt, the same as our lead. That part of it which melted first, was called *stannum*, and was, in all probability, a metal nearly resembling our tin; indeed the French *étain*, the English and low German *tin*, and the high German *zinn*, were apparently derived from the Latin *stannum;* that portion which was next melted was termed *argentum*, or silver, and what remained in the furnace was denominated *galena*, which, being once more fused, gave *nigrum plumbum* unmixed with the other component parts. *Stannum* was, therefore, probably a metal composed of lead and silver, for, it must be remarked that all kinds of lead ore, except that found at Bleyberg near Dillac, in the Duchy of Carinthia, contain a portion of silver, and some in such quantities, that they might with great propriety be called silver ores, or rather argentiferous lead ores, or plumbiferous silver ores. We find mention frequently made by the ancients of lead unmixed with silver, but it should be recollected that they paid little attention to a small admixture of silver, and never separated it but when it might be obtained in sufficient quantities to defray the expenses of smelting, which would certainly never be the case were only a few ounces, or even a pound of silver, contained in a quintal of lead.

A great deal of lead was obtained by the ancients from argentiferous ores, when these metals were separated. The ore was first pounded very fine, then washed and roasted, and afterwards formed into a powder or paste, which was then put into a furnace, and gave by the first fusion a regulus composed of silver and lead, and called *stannum*; to separate the silver, it was again fused in a particular refining furnace with a hearth of lixiviated ashes. Silver was thus obtained, and that substance called by Pliny *galena*, or *molybdæna*, which, by a third fusion, produced lead. These three parts, namely, *stannum*, *argentum*, and *galena*, or *plumbum nigrum*, were considered by the above-mentioned author as the component parts of lead ore, but not indeed according to the present signification. This shews that the *stannum* of the ancients was not our tin, but the substance denominated *werk* in our smelting-houses. *Electrum* was a metal partly composed of silver and partly of gold, the art of separating which was unknown to the ancients.

Amongst some of the oldest church vessels are some which have been considered *vasa stannea*, and which, when scoured and polished, have a silvery brightness, and become of a greyish colour if left long without cleaning.

It is not probable that the Phœnicians could have obtained tin from Spain, Portugal, and England, in such quantities as to have distributed it all over the old world so early as we find mention made of the word κασσιτερος by the Greeks, which, in all likelihood, meant nothing more than the *stannum* of the Romans. That real tin was afterwards known to the Greeks is most certain, but the express time when they first became acquainted with it has not been determined; and, probably, they considered it as a variety of their κασσιτερος or *stannum*, as the Romans declared both to be a variety of lead, and the Greeks gave no new name to the real tin. However, it was probably named at one time Tyrian, or Celtic tin, on account of Tyre being the principal mart for this metal, for we find mention made in Aristotle of τον κασσιτερον τον Κελτικον, which was no doubt the distinction drawn between their own and foreign tin.

The words *incoquere* and *incoctitia,* used by the Latins, seem to imply that they were acquainted with the art of tinning, by immersing vessels, as at present, into melted tin, although they have left us no account of it, and Pliny merely says, that a coating of *stannum* improved the taste of food, and guarded against verdigris. Among those vessels found at Herculaneum, the greater part were of copper or *stannum*; some silvered, but none tinned.

Several pieces of tin were dug up in Yorkshire in the beginning of the last century, and some tin vessels, with Roman inscriptions on them, were found in 1756, in Cornwall, which are the only two instances of cast-tin having been known to be manufactured by the ancients.

The history of the tin trade of the Phœnicians, Greeks, Gauls, and Romans, is very doubtful, as is also the situation of the Cassiterides Islands, from which they procured their tin, and which have been generally supposed to be the Scilly Islands, with part of the coast of Cornwall, which, at a distance, wears the appearance of an island.

No proofs of the Phœnicians having worked mines there can be brought forward, but, from various antiquities, it is supposed that the Romans dug up the ore themselves from the mines, and were in possession of works for extracting the metal.

Ictis, an island to which the Britons carried tin, and whence it was exported by the Gallic merchants, has been considered to be the Isle of Wight; but some think it to have been a general appellation for a peninsula or bay, as *ik* or *yk* is a common termination of the names of the creeks in Cornwall.

Most English writers assert that tin was first discovered in Germany in 1241, by a Cornish man, who had fled there on account of a murder which he had committed; but German writers do not mention this circumstance; on the contrary, they say that tin was discovered there in 1146 by a peasant of the village of Chodicze, named Wnadec.

The art of tinning plate-iron was invented either in Bohemia or Germany, but at what period is uncertain.

In 1670, an Englishman of the name of Andrew Yarranton, was sent to Saxony to learn the process of tinning, where, having acquired the necessary knowledge, he returned to his native country, bringing with him some German workmen, and established a manufactory of tin-plate. But a person of distinction having made himself acquainted with the art, obtained a patent for the process; in consequence of which the undertaking in which Yarranton had engaged was abandoned, and yet no use was subsequently made of the patent, and the manufacture was not recommenced until about the year 1720, when it is supposed to have been undertaken at Pontypool in Monmouthshire.

VERDIGRIS.

ÆRUGO;—ANCIENT PROCESS OF MAKING VERDIGRIS;—USE;—MODERN MANUFACTURE.

Various contradictory opinions have been entertained respecting the preparation of verdigris; the present process is nearly similar to that employed by the ancients. Every natural green copper calx was by them denominated *ærugo*; but it is certain that their artificial *ærugo* was simply our verdigris, or copper converted into a green calx by vinous acid. The method of procuring this substance was easily seen, as copper, when exposed to acids, invariably contracts a green rust. The ancients employed for this purpose either plates and vessels, or filings and shavings of copper, with the sourest vinegar, or the lees of wine, or the stalks and skins of grapes, after the juice has been pressed from them. Sometimes plates of copper were exposed to the vapour arising from vinegar confined in close vessels, sometimes the vinegar was poured on them, and not unfrequently copper filings were pounded with vinegar in a copper mortar, till they became green calx.

Verdigris was, at first, principally used medicinally, when the copper calx was compounded with various salts and other ingredients. One of these compositions was called vermicular verdigris, probably on account of its assuming the appearance of worms or threads. Verdigris was also used as a colour, for which reason it has been reckoned among the Pigments by Vitruvius.

The greater part of our verdigris was formerly manufactured at Montpelier. The process is simple: the dried stalks of grapes being steeped in strong wine, are brought to a sour fermentation, after which they are placed in an earthen-pot, with alternate layers of plates of copper, the surface of which becomes corroded in a short time, and the calx is then scraped off.

Swedish copper is chiefly employed in this manufacture, which was carried on very profitably at Montpellier so early as the fifteenth century. It still flourishes to a considerable extent, both there and in other parts of the south of France; but experiments have been made in other countries, by which it has been discovered that copper may be corroded by means of mineral acid; which process is much less expensive.

ULTRAMARINE.

DESCRIPTION AND PROPERTIES; — LAPIS LAZULI; — SAPPHIRE; — CÆRULEUM; — EXPERIMENT OF SIR HUMPHRY DAVY; — DERIVATION OF THE WORD LAZULI; — LAZURIUM.

Ultramarine is a very fine blue powder, nearly resembling, in colour, the corn-flower, or blue-bottle, and has the peculiar property of neither fading nor becoming tarnished, when exposed to the air or to a moderate heat. On this account it is used in painting, but not to so great an extent as before the discovery of smalt, which is a much cheaper article. It is composed of the blue parts of the lapis lazuli, which is found in the mountains of that part of Tartary called Bucharia, whence it is sent to the East-Indies, and from thence to Europe. Lapis lazuli being extremely scarce, and consequently dear, other stones of a similar nature are often substituted for it, and hence many contradictions are to be found in the works of authors who speak of its properties and country. Whether the Greeks and Romans were acquainted with ultramarine is uncertain, for although, in the decline of the Roman language, we find the word *ultramarinum*, yet it certainly never meant a paint. However, it is probable that the lapis lazuli was known to them, and was the sapphire of the ancients, as it was of a sky-blue colour, with a violet or purple shade, and sometimes was of a dark or blackish blue colour. It was likewise spotted with a great many gold or golden-yellow points, and was capable of being polished or cut; but, if not perfectly pure, and unmixed with any hard extraneous particles, was unfit for the lapidary.

It was often procured in such large pieces as to be employed for inlaid or mosaic-work, and was not unfrequently compared to copper-blue, copper-ore, and earth and stones impregnated with that metal. Its medicinal effects were such as are ascribed to copper calx, and it formed veins in rocks of other stones. There is no doubt that a stone with these properties could not be the sapphire of our jewellers, but was most certainly our lapis lazuli, which accords with the above description in every respect. The blue colour of the lapis lazuli has, however, been proved to originate from iron, and not from copper, as was generally supposed. The medicinal properties of the sapphire of the ancients could only be produced from a mixture of copper, which exists in a spurious species found in Persia, so that it is clear that they considered this "Armenian stone," or false lapis lazuli, to be the real kind.

It cannot, therefore, be doubted that the ancients were acquainted with our lapis lazuli; but whether they used it as a paint, or prepared ultramarine from it, has not yet been ascertained. However, although it is possible that their *cæruleum* may sometimes have been real ultramarine, yet it is probable that, in general, it was merely copper-ochre. This inference has, indeed, been lately established, since the period when Professor Beckman wrote, by the experiments of Sir Humphry Davy. In clearing away the rubbish within the baths of Titus, the walls of which display many beautiful specimens of fresco painting, the painter's room was discovered; and in several of the jars were found different kinds of paint, among which was a quantity of the beautiful celestial blue in question. Sir Humphry not only succeeded in analyzing this substance, which he found to consist of a frit of copper, soda, and silex, but recomposed it from fresh materials, so as to produce the identical colouring matter.

The term lazuli is undoubtedly of Persian origin, from which country the stone has hitherto been brought. The original word is *lazuardi*, which, in common pronunciation, sounds like *lazurd*, and this the Arabians have corrupted into *lazur*, conformably to their custom of confounding the letters *r* and *l*. It properly signifies a blue colour, as well as the mineral, but was at first used in Europe to express blue stones, and blue colours employed in painting, and also mountain blue impregnated with copper. The word *lazurium* may be found in writings so far back as the sixth century ; and we find in the receipts for painting given in the eighth century, one for preparing a kind of blue denominated *lazuri*. It may be seen, from a passage of Arethas in the eleventh century, explaining a verse of the book of Revelations,* that sapphire was that stone from which *lazurium* was made, which is a strong proof that the sapphire of the ancients was our lapis lazuli, and appears to be the first certain mention of the real ultramarine.

The word *ultramarine* or *azurrum ultramarinum* seems to have been common about the end of the fifteenth century. In the beginning of the sixteenth century, Vanuccio Biringoccio, gave directions for preparing the real ultramarine, which he has sufficiently distinguished from copper azure, or *azurro dell' Alemagna*, describing it as being made from the lapis lazuli, which is the matrix of gold-ore. The stone, after being pounded and washed, was reduced to an impalpable powder, and afterwards brought back to its lively and beautiful colour by means of a certain paste made with gum, when it was refined and dried. This composition was capable of withstanding both fire and water. In the beginning of the sixteenth century the father of the celebrated Giambatista Pigna, an apothecary at Modena, acquired immense riches by a preparation of ultramarine. Alexius Pedemontanus* has been thought to have first mentioned ultramarine, but this cannot be true, as he wrote in the beginning of the sixteenth century, and, therefore, in all probability, only first gave a complete account of the method of preparing it. His receipt has been followed ever since, as being the best and most certain. The English and French authors affirm that the preparation of ultramarine was discovered in England, and that a servant of the East-India Company revealed it, in order to be revenged for some injury which he had sustained : but the assertion is without foundation.

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* Revelations, ch. xxi. v. 19.

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* *Piedmontanus, de Secretis.*

ZINC.

BRASS;—TOMBACK;—PINCHBECK;—PRINCE'S METAL;—CALAMINE;—CADMIA;—DISCOVERY OF ZINC.

ZINC is a metal with which the Greeks, Romans, and Arabians were totally unacquainted, if we may judge by its not having any chemical character assigned to it in common with other metals, and by its not having been mentioned by any ancient writer. Only one instance of its having been supposed to have been discovered among some ruins of antiquity is upon record, and it was then so imperfectly examined as to leave the reality of the metal in as great obscurity as ever.

There is no doubt that the ancients were acquainted with that mixture of zinc and copper called brass; with tomback, pinchbeck, prince's-metal, &c. Mines which contained ores from which this gold-coloured metal was derived were held in great estimation, and their exhaustion was greatly regretted. At length, however, it was discovered that a kind of earth (probably calamine, when added to copper, while in a state of fusion,) gave it a yellow colour; it was, therefore, used in the same manner as calx of cobalt was employed in colouring glass, before that metal itself was known. Both Aristotle and Strabo mention an earth of that kind, the use of which, in making brass, was retained through many centuries. But when calamine was found in sufficient quantities, the old mode of procuring brass from copper ore that contained zinc was abandoned, as it was found more convenient to extract pure copper from it first, and afterwards to convert it into brass by the addition of calamine.

The word *cadmia*, which some have supposed to signify zinc, only means ore that contained that metal; and when it was afterwards known that calamine imparted a yellow colour to copper, it also acquired that name. Brass was supposed to be only a more valuable kind of copper. Both copper and brass were, for a great length of time, called indiscriminately *æs*, and it was not until a late period that mineralogists gave to the former the name of *cuprum*.

The first author by whom zinc is mentioned is Albertus Magnus, whom we have already had occasion to notice more than once. From the period when he wrote, which was the thirteenth century, there is no intelligible account of it until the time of Theophrastus Paracelsus, who died in 1541; and information respecting it seems to have been, even then, both scarce and imperfect.

The first person who procured this semimetal from calamine, by the addition of some inflammable substance, was one Henkel, who published an account of his discovery in 1741, but kept a portion of the process secret. The greater part of that now used is imported from the East-Indies.

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FINIS.

LONDON:
PRINTED BY COX AND BAYLIS, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.